Haida Gwaii/Queen Charlotte Islands LUP Base Case Analysis

Timber Supply Modeling Assumptions

Modeling Assumptions from TSR and Management Plan Documents for TSA 25, TFL 25, TFL 49, TFL 47, and Landbase and Management Assumptions Specific to the LUP Base Case Analysis

DRAFT
October 20, 2004

prepared for: Ministry of Sustainable Resource Management
prepared by: Cortex Consultants Inc.

Table of Contents

Table of Contents 2

List of Tables 4

List of Figures 6

1.0 Introduction 7
- 1.1 Haida Gwaii Target Model (HGTM) 7
- 1.2 Haida Gwaii Landscape Model (HGLM) 7
- 1.3 Environmental Indicators Model 7
- 1.4 Scenarios 8
  - 1.4.1 Base Case 1 (BC1) 8
  - 1.4.2 Base Case 2 (BC2) 8
  - 1.4.4 Base Case 3b (BC3b) 8
  - 1.4.5 Base Case 3c (BC3c) 8

2.0 Timber Supply Land Base Reductions 9
- 2.1 Land not administered by the BC Forest Service for timber supply 9
- 2.2 Land classified as non-forest 9
- 2.3 Non-commercial cover/ non-productive forests 9
- 2.4 Environmentally sensitive areas 10
- 2.5 Unstable Terrain 10
- 2.6 Areas with high recreation values 11
- 2.7 Areas considered inoperable 11
  - 2.7.1 Helicopter operability 13
- 2.8 Unmerchantable forest types 14
- 2.9 Roads, trails, and landings 14
- 2.10 Cultural heritage resources 14
- 2.11 Riparian management areas (RMAs) 15
  - 2.11.1 TSA 25 15
  - 2.11.2 TFL 25 16
  - 2.11.3 TFL 39 17
  - 2.11.4 TFL 47 18
- 2.12 Protected Areas 19
- 2.13 Timber Licence Reversions 19
- 2.14 Summary table of landbase reductions 21

3.0 Forest Management Assumptions 23
- 3.1 Harvesting 23
  - 3.1.1 Utilization levels 23
  - 3.1.2 Volume exclusions for mixed species stands 23

3.1.3 Minimum harvest age 24
3.1.4 Harvest scheduling priorities 25
3.1.5 Harvest flow constraints 26
3.2 Unsalvaged losses 26
3.3 Silviculture 26
3.3.1 Silviculture and regeneration activities in managed stands. 26
3.3.2 Immature plantation history 30
2.3.3 Not satisfactorily restocked areas 30
3.4 Integrated resource management 30
3.4.1 Visual values 30
3.4.2 Water quality 31
3.4.3 Landscape-level biodiversity 31
3.4.4 Critical Species 32
3.4.5 Wildlife trees 32
3.4.6 Retention 33
3.5 Analysis Unit Definitions 35

4.0 Environmental Indicator Model 44
4.1 Representation of Linear Features 44
4.1.1 Roads 44
4.1.2 Stream Crossings 44
4.2 Point sampling buffer for goshawk 44
4.3 Environmental Indicators 45

Appendix A - Development of the Spatial Landbase 46
A.1 Attributes of Spatial Data 46
A.2 Spatialization of the THLB 47
A.2.1 Legislated Retention 47

Appendix B - Landbase Assumptions (Target Models) 51
B.1 Management Units 51
B.2 Woodshed Units 51
B.3 Provincial Landscape Units 52
B.4 Contribution Class 53
B.5 Harvesting System 53
B.6 Management State 54
B.7 Biogeoclimatic Zone /Sub-zone / Variant 54
B.8 Natural Disturbance Type 55
B.9 Visual Quality Objective Zones 55
B.10 Community Watersheds 55
B.11 Ecosections 56
B.12 Cabinet approved PAS study areas - Goal 1 56
B.13 Cabinet approved PAS study areas – Goal 2 57
B.14 Haida Protected Areas 58
B.15 Northern Goshawk Habitat 58

B.16 Tlell Watershed 59
B.17 Tlell Fire Area 59
B.18 Stewardship Zones 59
B.19 PTT Watersheds 60

Appendix C - Landscape Model – HGLM 65
C.1 Landbase Assumptions 65
C.2 Landbase Requirements 66

Appendix D - Environmental Indicators Model 67
D-1 Landbase Requirements 67
D-2 Environmental Indicator Output Files 67

List of Tables

Table 2.1 Land not administered by the BC Forest Service for timber supply 9
Table 2.2 Land classified as non-forest 9
Table 2.3 Non-commercial cover and non-productive forests 9
Table 2.4 Environmentally Sensitive Areas 10
Table 2.5 Unstable Terrain 10
Table 2.6 Areas with high recreation values 11
Table 2.7 Operability 11
Table 2.8 Unmerchantable forest types 14
Table 2.9 Roads, trails, and landings 14
Table 2.10 Cultural heritage resources 14
Table 2.11 TSA 25 Riparian Management Area stream classification 15
Table 2.12. TSA 25 Riparian Management Area buffer widths (Reproduced from Eng 2000) 16
Table 2.13 TFL 25 Block 6 Riparian Reserve zones 17
Table 2.14 TFL 39 Assignment of Stream Class (Table 8-3 from the TLF 39 Data Package) 17
Table 2.15 TFL 39 Netdowns for Stream Riparian Areas (Table 8-4 from TFL 39 data package). 18
Table 2.16 TFL 39 Netdowns for Lakes and Wetlands Riparian Areas (Table 8-5 from TFL 39 data package). 18
Table 2.17 TFL47 riparian reserve and management zones. 19
Table 2.18 Timber Licence Reversions 19
Table 2.19 Summary table of landbase reductions by scenario 21
Table 3.1 Utilization levels 23
Table 3.2 Volume exclusions for mixed species stands 23

Table 3.3 Minimum harvest age criteria 24
Table 3.4 Harvest scheduling priorities 25
Table 3.5 Harvest flow constraints 26
Table 3.6 Unsalvaged losses 26
Table 3.7 TSA 25 Silviculture and regeneration 27
Table 3.8 TFL 25 Silviculture strategies 28
Table 3.9 TFL 39 Regeneration Models 29
Table 3.10 TFL 47 Regeneration models 29
Table 3.11 Immature plantation history 30
Table 3.12 Not satisfactorily restocked areas 30
Table 3.13 Visual values 31
Table 3.14 Water quality 31
Table 3.15 Landscape-level biodiversity 32
Table 3.16 Wildlife Tree Patches 32
Table 3.17 Weyerhaeuser Stewardship Zones 33
Table 3.18 Analysis unit definitions 1 35
Table A.1 Data atttributes 46
Table A.2 Summary of area in TSA25 THLB both prior to, and following the RMA/Road corrections. 48
Table A.3 Voluntary retention and Old Growth reductions in TFL 39 stewardship zones. 49
Table A.4 Summary of BC3 netdowns in TSA25, TFL25 and TFL47 49
Table A.5 Summary of BC3 netdowns for TFL39 50
Table B.1 Management unit summary 51
Table B.2 QCI LUP analysis area woodshed units 51
Table B.3 Provincial landscape units 52
Table B.4 QCI LUP contribution classes 53
Table B.5 QCI LUP harvesting systems 54
Table B.6 QCI LUP management states 54
Table B.7 QCI LUP ecosystem zones 54
Table B.8 QCI LUP natural disturbance types 55
Table B.9 QCI LUP VQO zones 55
Table B.10 QCI LUP community watersheds 56
Table B.11 QCI LUP ecosections 56
Table B.12 QCI LUP Goal 1 PAS study area 56
Table B.13 QCI LUP Goal 2 PAS study areas 57
Table B.14 Haida protected areas 58
Table B.15 QCI LUP northern goshawk habitat 58
Table B.16 Tlell watershed 59

Table B.17 Tlell fire area 59
Table B.18 TFL 39 stewardship zones 59
Table B.19 QCI LUP PTT watersheds 60
Table C.1 Spatial data requirements of the Haida Gwaii Landscape Model (HGLM) 65
Table C.2 Spatial data requirements of the SELES Environmental Indicator Output model. 66
Table D.1 Spatial data requirements of the SELES Environmental Indicator Output model. 67
Table D.2 Environmental indicator output file standards for the ecosystem representation indicator provided through the HG/QCI forest-level modelling process. 68
Table D.3 Environmental indicator output file standards for the hydroriparian and road impact indicators provided through the HG/QCI forest-level modelling process. 68
Table D.4 Environmental indicator output file standards for the Goshawk indicator provided through the HG/QCI forest-level modelling process. 69
Table D.5 Environmental indicator output file standards for the Marbled Murrelet indicator provided through the HG/QCI forest-level modelling process. 70
Table D.6 Environmental indicator output file standards for the Black Bear indicator provided through the HG/QCI forest-level modelling process. 70

List of Figures

Figure 1. Timber harvesting landbase by scenario 22

1.0 Introduction

This information package documents the assumptions and describes the modelling procedures that are used in the Timber Supply Analysis (TSA) for the QCI LUP. Two models are being utilized in the QCI LUP timber supply analysis, and a third model has been developed to report on environmental indicators.

1.1 Haida Gwaii Target Model (HGTM)

The first model, the Haida Gwaii Target Model (HGTM), uses Remsoft's spatial modeling system Woodstock/Spatial Woodstock/Stanley. Woodstock is a strategic forest estate model that can use linear programming to solve models with complex management themes, objectives, and forest cover constraints.

1.2 Haida Gwaii Landscape Model (HGLM)

The second model, the Haida Gwaii Landscape Model (HGLM), uses a system called the Spatially Explicit Landscape Event Simulator (SELES). SELES provides a structured modelling framework for performing spatially explicit operations, and for developing and executing spatial landscape simulation models.

The spatial timber supply model (STSM) is a tool implemented in SELES for performing timber supply analyses that can incorporate spatial effects and aspects of ecosystem dynamics such as succession. The basic features include landscape projection (e.g., stand aging through time, and estimation of volume and height using curves from stand level growth and yield models), harvesting of target volumes, and tracking and output of various indicators of harvesting, sustainability and landscape condition. The STSM differs from other aspatial simulation models in that it can incorporate spatial features such as spatial blocks, explicit adjacency, and road access constraints. Additionally, spatially explicit objectives can be set such as patch size distribution, area-based cut control, operating areas, partial harvesting. STSM also provides support for ecosystem dynamics such as succession and natural disturbance.

SELES is also used to simulate the placement of variable retention patches in order to provide a spatially location the TLHB and areas of retention. The model determines the retention area within a larger forest cover polygons, and locates retention patches in clusters of cells on the landscape. The resulting layer provides a categorical representation of the contributing landbase, where each cell is either designated as THLB or inoperable.

In order to measure length and density of roads, and to count the number of roads crossing streams, a model was implemented in SELES. This model uses the road schedule to grow out along newly activated roads and measure road length and count the number of times the newly active road segment crosses a stream.

1.3 Environmental Indicators Model

For reporting of Environmental Indicators, a summary model was developed using SELES that measures landscape attributes within unique combinations of landscape strata. The model runs

through the dynamic time series of maps produced by the timber supply model and records the state of the landscape within each strata combination, enabling domain experts to evaluate change in attributes of the land base.

Area of habitat within Northern Goshawk territories is summarized using a separate model implemented in SELES. The model sequentially visits each goshawk nest site and dynamically grows a sampling buffer out to a specified buffer radius. The area of forest within each seral stage is recorded for each unique territory. This approach was chosen rather than representing all goshawk territories on a static single map, as it is simpler that trying to index areas where multiple ranges overlap.

1.4 Scenarios

Five base case (BC) scenarios were evaluated, each of which reflects different landbase and management assumptions:

1.4.1 Base Case 1 (BC1)

The objective of BC1 is to apply the most recent TSR base case modelling assumptions and demonstrate that the modelling systems used in this study can produce similar results to those documented in the TSR timber supply analysis reports. The results are unlikely to be identical due to changes in the inventory and different yield assumptions.

1.4.2 Base Case 2 (BC2)

The objective of BC2 is to isolate the impact on timber supply of changes to the THLB. BC2 applies the same modeling assumptions as BC1 but implements changes to the THLB. In the QCI TSA a spatial representation of the riparian areas was implemented and low-site cedar stands that are currently deemed economically operable by helicopter logging were included in the THLB. In TFL 47, similar adjustments were made to the THLB for helicopter logging.

1.4.3 Base Case 3a (BC3a)

The objective of BC3a is to evaluate the impact of excluding Haida protected areas from the cut. The scenario applies BC2 and excludes Haida protected areas from QCI TSA, TFL 39, and TFL 47.

1.4.4 Base Case 3b (BC3b)

The objective of BC3b is to evaluate the impact of increased levels of stand-level retention believed to be currently implemented on Haida Gwaii. The scenario adds 20% (relative to BC2) stand-level retention to BC3a.

1.4.5 Base Case 3c (BC3c)

The objective of BC3c is to reduce the harvest level on TFL 39 to the current level of 600,000 m3. The scenario applies BC2 but changes the stand-level retention on TFL 39 to 50% (relative to BC1).

2.0 Timber Supply Land Base Reductions

The following reductions were applied to the landbase in the two timber supply models.

Note – reductions may have been applied in a different order in different management units.

2.1 Land not administered by the BC Forest Service for timber supply

Table 2.1 Land not administered by the BC Forest Service for timber supply

Management Unit	Assumption
TSA 25	Areas with ownership codes other than 62C, 69C, and 70N were removed from the timber harvesting landbase
TFL 25 block 6	NA
TFL 39 block 6	NA
TFL 47 block 18	NA

2.2 Land classified as non-forest

Table 2.2 Land classified as non-forest

Management Unit	Assumption
TSA 25	Inventory type identity 6 (non-forest alpine forest, lakes, rocks, etc.) and 8 (untyped) were excluded from the land base considered for timber supply.
TFL 25	Non-forest areas excluded: alpine; rock and slides; swamp, marsh, creek, river, lake; town; dump, camps, and sort; islands; classified roads and pits; hydro and telephone right-of-way.
TFL 39	Mapped non-forest areas of alpine, rock, water, swamp removed.
TFL 47	Lakes, Ocean, River, Rock, Rock quarries, Swamp, and areas with No Type Available (NTA) were removed from the landbase.

2.3 Non-commercial cover/ non-productive forests

Table 2.3 Non-commercial cover and non-productive forests

Management Unit	Assumption
TSA 25	Inventory type identity 5 (non-commercial brush species) were excluded from the timber-harvesting land-case.
TFL 25	Non-productive forest areas excluded. Non-commercial cover (mostly brush) excluded. Low sites 100% reduction (ecosystem types A, H3FO, H2, H11, H32, Q10, P, W).
TFL 39	Non-productive forest areas, mainly defined as having inventory volume of less than 211 m3 per, were excluded from the analysis. There were no productive forest areas of Site Index 10 and less (and therefore no "low" sites were excluded.

Management Unit	Assumption
TFL 47	Alpine, brush, clearing, non-commercial, non-productive, power line, and slide areas were removed from the landbase. 100% of low site were removed defined by forest type and site class (Cw<10.5, Yc<10.5, Deciduous<6.0, Hw<9.5, Ss<7.5).

2.4 Environmentally sensitive areas

Table 2.4 Environmentally Sensitive Areas

Management Unit	Assumption		
	ESA category	ESA description	Reduction percentage (%)
TSA 25	Es1, Es2	Soils	100
	Ea1, Ea2	Avalanche	100
	Er	Recreation	No reduction
	Ew	Wildlife	No reduction
	Eh	Watershed	No reduction
	Ep	Regeneration problems	No reduction
TFL 25	All	--	No reduction – assume captured in operability definition, WTP retention, old growth targets, riparian reserves.
TFL 39, MP #8	Ea1	Avalanche	None in block 6
	Es1, Es2	Soils	None in block 6
	Ew	Wildlife	None in block 6
	Ep1, Tsitika	Regeneration problems	None in block 6
	Er1	Recreation	100
	Er2	Recreation	50
TFL 47	ESA REC 100	Recreation	100
	ESA REC 50	Recreation	50
	ESA REGEN 90	Regeneration problems	90
	ESA REGEN 50	Regeneration problems	50
	ESA WILDLIFE 80	Wildlife	80

2.5 Unstable Terrain

Table 2.5 Unstable Terrain

Management Unit	Assumption
TSA 25	For TSA 25, in addition to ESA class Es1 and Es2 netdowns, terrain stability mapping (TSM) was used to identify areas with sensitive or unstable terrain. Areas identified as TSM class IV and V were removed from the THLB.
TFL 25	Terrain classes were removed as part of the operability definition only for conventional yarding systems, where

	adequate deflection was required on Class 4 terrain, and no Class 5 polygons were considered.
TFL 39	Class IV 20% netdown. Class V 90 % netdown.
TFL 47	Class IV 20% netdown, Class V 90% netdown.

2.6 Areas with high recreation values

Note: these are often the same areas as those removed as Recreation Environmentally Sensitive Areas (see section 1.4)

Table 2.6 Areas with high recreation values

Management Unit	Assumption			
TSA 25	**Recreation value description**	**Recreation feature significance code**	**Recreation management class code**	**Reduction percentage (%)**
	Areas to be managed exclusively for recreational values	A or B	0	100
	Areas requiring special management to protect recreational values	A or B	1	50
TFL 25	No areas removed for recreation. Established campsites in Block 6 were removed as either inoperable (see 2.7) or non-forest (see 2.2).			
TFL 39	Recreation feature class 0 (Er1) 100% reduction. Recreation feature class 1 (Er2) 50% reduction. See section 1.4 on environmentally sensitive areas.			
TFL 47	**Feature significance code**	**Management class**	**Reduction percentage (%)**	
	A, B, or C	0	100	
	A or B	1	50	

2.7 Areas considered inoperable

Forest operability classifications reflect both physical operability and economic operability. Physical operability measures the presence or absence of physical barriers or limitations to harvesting. Economic operability reflects both the relative accessibility (and therefore cost) of harvesting, and the merchantability of stands.

Table 2.7 Operability

Management Unit	Assumption				
TSA 25.Physically inoperable areas were excluded. Stands were	**Access difficulty**	**Harvest system**	**Stand type**		
			Cw, Cy	**Ss**	**Hw**
	Easy	Conventional	NMV[1]>300	NMV>400	NMV>400

Management Unit	Assumption				
Stands were considered economically operable if they met the following criteria:	Moderate	Aerial	NMV>450	NMV>500	NMV>500
		Conventional	NMV>390	NMV>520	NMV>520
	Difficult	Aerial	NMV>590	NMV>650	NMV>650
		Conventional	NMV>510	NMV>680	NMV>680
		Aerial	NMV>770	NMV>850	NMV>850

In TSA 25 (Husby chart area), Cortex used the assumptions above, but adjusted the landbase to include additional low site cedar stands. We added 10% of the Husby chart area (2,560 hectares) back to the TSA 25 THLB.

TFL 25. Physical inoperability was defined as non-productive forest types (see 2.3), land feature limitations (e.g. major gullies), and areas rendered physically or economically inaccessible by extreme terrain and/or distance.

Economically inoperable forest cover was excluded from the THLB, and includes all mature height class 1 and 2; pure hemlock balsam height class 3 stocking class 3 open stands; and pine-dominated stands.

Economically marginal forest cover was removed from the Base Case THLB.

Harvest System	Economically marginal stands
Conventional yarding systems	Height class 3 standards with hemlock or balsam as primary species which are not in close proximity to economically unconstrained types
	Stocking class 3 (<40% crown closure) stands Douglas fir, cedar, cypress or spruce as primary or secondary species
	Deciduous stands – operability determination based upon stand attributes and topography
Non-conventional yarding systems	Height class 3 stands with cedar, cypress, spruce or Douglas fir as primary species (excluding stocking class 3 (<40% crown closure) stands) which are not in close proximity to economically unconstrained types.
	Height class 3 stands with cedar, cypress, spruce or Douglas-fir as secondary species with the exception of all height class 3 stocking class 3 combinations, which are excluded.
	Pure hemlock balsam height class 3 stands are excluded.

TFL 39. Mapped physically inoperable areas were excluded from the working landbase. Economically marginal areas were *included* in the THLB.

Stand type	Harvest system	Economic operability	
		Uneconomic	Marginal
Fir, Fir-Hem, Fir-Cedar	Conventional	<271 m^3/ha	271-380 m^3/ha
	Non-conventional	<434 m^3/ha	434-542 m^3/ha
Hemlock, Hem-Bal	Conventional	<325 m^3/ha	325-434 m^3/ha
	Non-conventional	<488 m^3/ha	488-597 m^3/ha
Hem-Bal-Cyp <40%X, Y, Z Grades	Conventional	<325 m^3/ha	325-434 m^3/ha
	Non-conventional	<434 m^3/ha	434-542 m^3/ha
Hem-Bal-Cyp >40% C, Y, Z Grades	Conventional	<434 m^3/ha	434-542 m^3/ha
	Non-conventional	>542 m^3/ha	542-651 m^3/ha
Cedar <40% x, Y, Z	Conventional	<271 m^3/ha	271-380 m^3/ha

Management Unit	Assumption			
	Grades	Non-conventional	<380 m^3/ha	380-488 m^3/ha
	Cedar>40% X, Y, Z Grades	Conventional	<380 m^3/ha	380-488 m^3/ha
		Non-conventional	<542 m^3/ha	542 651 m^3/ha
TFL 47 Physically inaccessible areas were removed from the landbase.	Economic operability was assumed if (1) stand volume>250 m^3/ha (2) majority of stand is "J" grade or better (3) some stands of less than 250 m^3/ha where adjacent to better stands (4) isolated stand were evaluated on an individual basis given their value and associated logging costs. Cortex Consultants Inc adjusted the operable landbase definition to account for heli--logging occurring outside the TSR THLB. The amount added back was 1,892 hectares. This amount was determined by comparing the areas harvested in current Forest Development Plans to the TSR THLB. If heli harvesting occurred outside the THLB then this area was reclassified as THLB for the Cortex analysis.			

1. NMV= net merchantable volume.

2.7.1 Helicopter operability

Cortex applied a spatialized helicopter operable zone in the HGLM in all management units. A spatialized heli-operable zone was created based on the Timberline study and by developing a general rule that can be applied across the landbase. The rule was as follows: A site is heli-access if (i) distance to current or future roads > 500m or (ii) distance to current or future roads > 100m and the site is unreachable from current or future roads without passing through steep slopes.

The first rule is based on the assumption that if there is no mapped current or future road near a site, then the only way to access it must be via helicopter. The second rule is based on the assumption that steep slopes (defined as > 100%) form a barrier to road access (e.g. a low-slope site on a bench above a cliff will not be accessible by road). The only exception to the latter is areas within 100m to a road.

The precise definition of "max distance to mapped roads" (for sub-rule (i)) and "steep slope" (for sub-rule (ii)) is not so critical because the Timberline study provides guidance as to how much area should approximately be in the heli zone. That is, the 500m and 100% numbers result from calibrating against the report. Conversely, it may not be appropriate to use the numbers for each woodshed in Timberline study as hard targets, since they are fairly general (e.g. all amounts are percents that are rounded to the nearest 5%) and don't capture the fully spatial pattern of accessibility that the rule can.

The above rule captures within 1% the amount of the spatial THLB that would result from the Timberline information (just over 23,000 ha of THLB in both cases). Most, but not all, woodsheds had a fairly close match (but the result averages out across woodsheds).

2.8 Unmerchantable forest types

Table 2.8 Unmerchantable forest types

Management Unit	Assumption
TSA 25	Hardwoods and pine (inventory type groups 27-42) were removed.
TFL 25	No unmerchantable forest types were mentioned that were not accounted for in the operability definition.
TFL 39	No mention of unmerchanteable forest types found in data package.
TFL 47	NA – no problem forest types not already accounted for.

2.9 Roads, trails, and landings

Table 2.9 Roads, trails, and landings

Management Unit	Assumption
TSA 25	Existing roads, trails and landings (Age classes 1-4) reduced at 7.2% of current productive forest available for timber harvesting (based on estimate). Future roads, trails and landings (Age classes 5-9) reduced at 6.5% current productive forest available for timber harvesting (based on estimate), after first time harvest only.
TFL 25	Classified roads removed as discrete polygons. Unclassified roads removed as 10 m unproductive width. Future road system was predicted in the GIS and future roads were removed as 10 m unproductive width.
TFL 39	Major mapped roads removed as discrete polygons, other mapped roads removed along with a 13 m buffer. For future roads, 6% reduction in productive area after initial harvest for mature forest areas in conventional harvesting areas, and 5% reduction for second-growth areas established prior to 1940. No reductions in productive area for non-conventional harvest
TFL 47	Main roads were removed from forested areas at a total width of 20 m. Deactivated roads were removed form forested areas at a total width of 10 m. Future roads were netted out of THLB area over 45 years of age at a 5.3% netdown once the current stand is harvested.

2.10 Cultural heritage resources

Table 2.10 Cultural heritage resources

Management Unit	Assumption
TSA 25	6.4% cutblock reduction (based on average reserved in past harvests)

Management Unit	Assumption
TFL 25	No reduction for cultural heritage resources
TFL 39 block 6	MP # 8 mentions that "a revised Archaeological Overview Assessment (AOA), funded by the MoF, has been completed in the Block 6 portion of the Queen Charlotte Islands", and that "the analysis will include an additional netdown allowance for CMTs in areas zoned in the AOA for high likelihood of CMTs". Details are not provided.
TFL 47	6.4% reduction of area available for timber harvest that is operable and >250 years in age.

2.11 Riparian management areas (RMAs)

2.11.1 TSA 25

In TSR 2, riparian management areas in TSA 25 were accounted for using an aspatial netdown of 9.8% of the timber-harvesting landbase to account for riparian management areas, including riparian reserve zones (RZZ) and riparian management zones (RMZ). The Cortex Haida Gwaii timber supply models reversed these netdowns, replacing them with a spatial methodology (outlined below) that resulted in an additional 9,485 hectares being removed from the timber harvesting landbase (see section A.2 on spatialization of the THLB).

Creation of Riparian Management Areas (RMAs) followed methods used in the Fraser TSR3, which are outlined in detail in a separate MoF technical report (Eng 2000).

Lakes, rivers and wetlands were first delineated from TRIM data, and classified according to the Riparian Management Guidebook Classification System. Rivers less than 100m width, and streams were classified into stream classes S2 – S6 based on slope class, and water type class (definite, indefinite, intermittent).

Table 2.11 TSA 25 Riparian Management Area stream classification

Stream Class	Water Type Class	Slope Class
S2/S3	Definite & Indefinite	<= 20% Slope
S4	Intermittent	<= 20% Slope
S5	Definite & Indefinite	> 30%, < 30%
S6	Definite & Indefinite	>= 30% Slope

The RMA buffers were then created around these features. The RMA buffers are composed of the sum of the width of the riparian reserve zone, and the effective width of the non-contributing area in the Riparian Management Zone.

Assumptions:

- No method of distinguishing S2 and S3 streams, so S2 was used as a conservative estimate for both types.
- S4 and S5 streams were assumed to be underrepresented in the TRIM maps and are therefore the buffer width was increased to compensate.

- S6 streams could not be identified and therefore it was suggested that some area based netdown by used to account for these features.

Table 2.12. TSA 25 Riparian Management Area buffer widths (Reproduced from Eng 2000)

Feature Class	Reserve Zone Width (m)	Management Zone Width (m)	Management Zone Retention (%)	Calculated RMA width	Implemented (modeled) RMA width
Streams					
2	30	20	0.5	40	40
3	20	20	0.5	30	40
4	0	30	0.25	7.5	10
5	0	30	0.25	7.5	10
6	0	20	0.05	1	1
Lakes					
1	10	0	0.25	10	10
2	10	20	0.25	15	15
3	0	30	0.25	7.5	7.5
4	0	30	0.25	7.5	7.5
Wetlands					
1	10	40	0.25	20	20
2	10	20	0.25	15	15
3	0	30	0.25	7.5	7.5
4	0	30	0.25	7.5	7.5
5	10	40	0.25	20	20

•

2.11.2 TFL 25

The timber supply analysis used the available stream classification to apply reserves to all known and predicted fish bearing streams, as required in the Forest Practices Code. Streams within Western Forest Products' GIS for TFL 25 were classed as S1 to S6 (per FPC definitions) or unclassified (with unknown fish presence and width).

Within the GIS, double-lined streams were assigned a riparian reserve based on their classification (outlined in the table below for Block 6 only). For unclassified streams, the GIS terrain model was used to separate and class streams of less than 30% gradient as being potentially fish bearing. A weighted average riparian reserve zone width was calculated based on the proportion of fish-bearing single line streams – for Block 6, it was estimated that 53% of the unclassified single line streams are fish bearing, and an average width of 10.4 m was calculated. This average reserve width was then applied sequentially starting with the lower gradient unclassified streams until 52% of the unclassified stream length was tagged with a reserve zone. This amounted to all o f the unclassified streams on topography of less than or equal to 15.9%.

Table 2.13 TFL 25 Block 6 Riparian Reserve zones

Feature Class	Reserve Zone Width (m)
Streams	
S1	50
S2	30
S3	20
S5	0
Lakes	
L1	10
L3	0

2.11.3 TFL 39

Hydrologic stream order information was used to approximate stream width. Where inventory information on the presence or absence of fish was not available, streams of a gradient of less than 20% were used to classify streams as fish bearing. If non-fish sections less than 150 metres long had fish bearing water upstream and downstream, this length was changed to fish bearing. The derived coverage of stream classes was reviewed by operations and changes were made accordingly.

Table 2.14 TFL 39 Assignment of Stream Class (Table 8-3 from the TLF 39 Data Package)

Stream Order	Implied Width (m)	Fish or Community Watershed	Default Stream (S) – Class
1	<=3.0	No	S6
2 plus	>3.0	No	S5
1	<1.5	Yes	S4
2	1.5 – 5.0	Yes	S3
3 or 4	5.0 – 20.0	Yes	S2
5 plus	>20.0	Yes	S1

Management zone netdowns were 60% of the maximum values defined in the Riparian Management Area Guidebook (see Table 2.15 below).

Table 2.15 TFL 39 Netdowns for Stream Riparian Areas (Table 8-4 from TFL 39 data package).

Stream[1] Class	Stream Order	Implied Width (m)	Reserve Zone (m)	Width (m)	% Netdown
S1	S05 plus	>20	50	20	30
S2	S03, S04	5 - 20	30	20	30
S3	S02	1.5 - 5	20	20	30
S4	S01	<1.5	0	30	15
S5	S02 plus	>3.0	0	30	15
S6	S01	=3.0	0	20	3

(1) Stream classes 1 to 4 apply to fish streams and community watersheds.
(2) Management Zone % netdowns are 60% of the maximum values defined in the Guidebook.

A netdown of 1% of the net landbase (after considering mapped netdowns) was made to allow for unmapped small streams (which are generally not expected to contain fish).

Buffers were created adjacent to mapped (1:20,000) lakes and wetlands and netdowns were applied as described below.

Table 2.16 TFL 39 Netdowns for Lakes and Wetlands Riparian Areas (Table 8-5 from TFL 39 data package).

		Size	Reserve Zone (m) (100% Netdown)	Management Zone		
				Width (m) All except Block 7	Width (m) Block 7[2]	Netdown (%)[1]
Lakes	L1 large	> 1000 ha	0	10	40	15
	L1	5 – 1000 ha	10	0	40	
	L2	1 – 5 ha dry zone[3]	10	20	20	15
	L3	1 – 5 ha wet zone	0	30	30	15
	L4	0.5 – 1 ha dry zone	0	30	30	15
Wet-lands	W1	> 5 ha	10	40	40	15
	W2	1 – 5 ha dry zone	10	20	20	15
	W3	1 – 5 ha wet zone	0	30	30	15
	W4	0.5 – 1 ha dry zone	0	30	30	15

(1) Management Zone % net-downs are 60% of the maximum values defined in the Riparian Management Area Guidebook
(2) The Mid Coast District requirement for a 40 m management zone adjacent to all L1 lakes, has been applied.
(3) The "dry" zone includes the CDF, CWHds, CWHdm and CWHxm biogeoclimatic zones. Other zones in TFL 39 are in the "wet" zone.

2.11.4 TFL 47

To estimate stream classes,

- mapped creeks large enough o be named were assumed to be S2 if they were identified as bearing fish according to the 1993 survey, or if they have a gradient below 20%.
- Mapped unnamed creeks with a gradient below 20% are assumed to be S3.

- Mapped creeks with gradients over 20% are assumed to be S5 or S6.

The table below shows riparian reserve and management zone widths, applied in accordance with the FPC Riparian Management Area Guidebook (1995).

Table 2.17 TFL47 riparian reserve and management zones.

Riparian Class	Reserve Zone Width (m)	Management Zone Width (m)	Total buffer width (m)	Reduction for reserves (%)
S1	N/A	N/A	N/A	N/A
S2	60	40	100	100
S3	40	40	80	100
S4	0	0	0	0
S5	0	60	0	0
S6	0	40	0	0

A volume reduction of 2.5% was applied at the yield table level to account for riparian reserve zones on unmapped streams.

No lake or wetland reserve zones were included - however, these areas had other attributes with a higher net-down priority, and were netted-out under another classification.

2.12 Protected Areas

In Base Case 2, only existing legislated protected areas are removed. In Base Case 3a and 3b, Haida Protected area are removed. The Haida Declared Protected Areas are Duu Guusd, Tlall (Tlell Watershed), 7AgangGuu (Government Creek), Kun Xalaas (Grey Bay - Cumshewa), Gwaii Gawgaay (Kootenay Inlet), Yaagun Siwaay (Yakoun Lake Watershed and Yakoun River Corridor) , Nang Xaldangaas (Naden Harbour - Masset Inlet), Kamdis (Kumdis Slough), Qaysun (Kitgoro-Niisii), Qaysun (Kaisun), Tsuuguus Gandll (Security Inlet), Qanuu Gandll (Kano [Givenchy Anchorage]), and Qanuu (Carew Bay). Goal 1 and 2 study areas were always included in the THLB.

2.13 Timber Licence Reversions

Table 2.18 Timber Licence Reversions

Management Unit	Assumption
TSA 25	Timber Licence areas contributed to the timber supply only after being harvested and regenerated (650 ha presently; assumed to revert at a rate of 85 ha per year)
TFL 25	NA
TFL 39	NA
TFL 47	NA

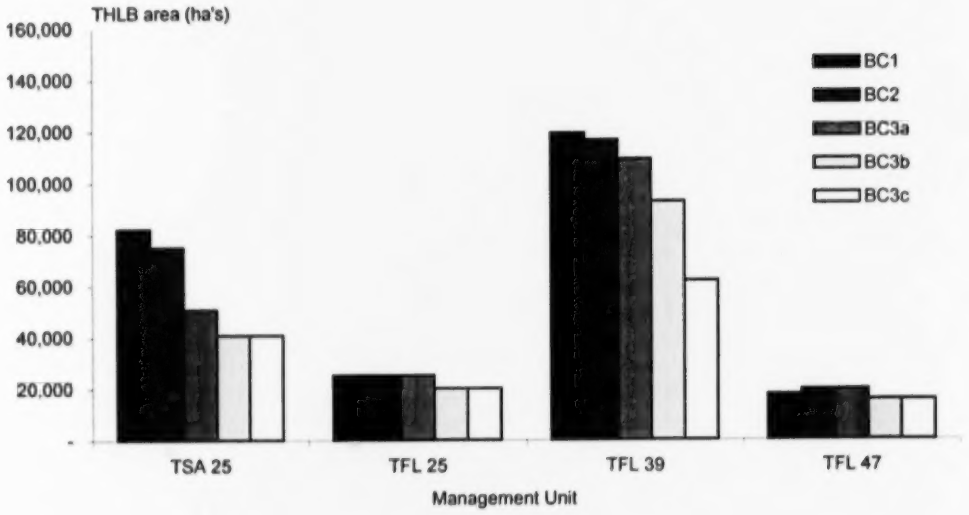
2.14 Summary table of landbase reductions

Table 2.19 Summary table of landbase reductions by scenario

Management Unit	Total Land Area					Total Productive					THLB				
	BC1	BC2	BC3a	BC3b	BC 3c	BC1	BC2	BC3a	BC3b	BC 3c	BC1	BC2	BC3a	BC3b	BC 3c
TSA 25	455,724	455,275	455,275	455,275	455,275	353,333	355,590	355,590	355,736	355,736	81,918	74,993	50,789	40,804	40,804
TFL 25	53,816	53,809	53,809	53,809	53,809	46,504	46,497	46,497	46,497	46,497	25,080	25,091	25,081	20,094	20,094
TFL 39	242,568	242,309	242,309	242,312	242,311	192,563	192,305	192,305	192,308	192,307	119,136	116,435	108,970	92,645	61,951
TFL 47	27,516	27,507	27,507	27,507	27,507	25,464	25,112	25,112	25,113	25,113	17,574	19,466	19,466	15,571	15,571
National Parks	147,554	147,554	147,554	147,554	147,554	-	-	-	-	-	-	-	-	-	-
Provincial Parks	77,660	77,660	44,660	77,660	77,660	-	-	-	-	-	-	-	-	-	-

Management Unit	Inoperable				
	BC1	BC2	BC3a	BC3b	BC 3c
TSA 25	271,416	280,597	304,801	314,932	314,932
TFL 25	21,424	21,406	21,416	26,403	26,403
TFL 39	73,427	75,870	83,335	99,663	130,356
TFL 47	7,890	5,645	5,645	9,542	9,542
National Parks	-	-	-	-	-
Provincial Parks	-	-	-	-	-

Figure 1. Timber harvesting landbase area (ha) by scenario



3.0 Forest Management Assumptions

3.1 Harvesting

3.1.1 Utilization levels

Table 3.1 Utilization levels

Management Unit	Age Classes	Assumption		
		Minimum diameter at breast height (cm)	Maximum stump height (cm)	Minimum top diameter inside bark (cm)
TSA 25	all	17.5	30.0	10.0
TFL 25, Firmwood standard 50%	Mature stands (141+ yrs)	17.5	30.0	15.0
	Immature stands (41-140 yrs)	17.5	30.0	15.0
	Managed Conifers	12.5	30.0	10.0
TFL 39	Mature (minimum 50% sound)	22.5	30.0	15.0
	Second growth (all live trees)	12.5	30.0	10.0
TFL 47, Firmwood standard 50%	Existing stands >120 years, all species	17.5	30.0	15.0
	1-120, all species	12.5	30.0	10.0

3.1.2 Volume exclusions for mixed species stands

Table 3.2 Volume exclusions for mixed species stands

Management Unit	Assumption
TSA 25	100% deciduous volume excluded in mixed species stands
TFL 25, Block 6	Deciduous volume is harvested and included in modeled timber flows.
TFL 39	TFL 39 will convert 50% of the remaining deciduous areas over 50 years. Volume in deciduous stands are not included in harvest schedules
TFL 47	Deciduous volume is harvested and included in modeled timber flows.

3.1.3 Minimum harvest age

Table 3.3 Minimum harvest age criteria

Management Unit	Assumptions	
TSA 25. Set for each analysis unit to the greater of (a) the estimated age at which the stand is predicted to reach a required volume; and (b) the age at which the stand's mean annual increment (MAI) achieves a value of 95% to the maximum culmination MAI.	**Analysis Unit**	**Minimum harvestable age**
	Cedar low – natural	210
	Cedar poor – natural	130
	Cedar good – natural	90
	Hemlock poor- natural	140
	Hemlock medium – natural	105
	Hemlock good – natural	65
	Spruce poor – natural	125
	Spruce good – natural	60
	Cedar low – managed	240
	Cedar poor – managed	140
	Cedar good – managed	100
	Hemlock poor – managed	140
	Hemlock medium – managed	110
	Hemlock good – managed	85
	Spruce poor – managed	130
	Spruce good – managed	80
TFL 25	The younger of (a) the age 95% of maximum MAI is attained; and (b) the age 30 cm DBHq (quadratic mean diameter) is attained.	
TFL 39	Minimum harvest age defined as minimum age of 35 years and minimum volume of 350m^3/ha, or age 200 if volume is below 350m^3/ha at age 200.	
TFL 47. Set at 90 % of peak MAI.	**Analysis Unit**	**Minimum harvestable age**
	Cedar medium – immature	77
	Cedar medium-old	N/A
	Cedar medium-reg	73
	Cedar poor- old	N/A
	Cedar poor- immature	99
	Cedar poor- mature	75
	Cedar poor- reg	91
	Dec-good-im	24
	Dec-good-mat	25
	Hem-good-im	52
	Hem-good-mat	39
	Hem-good-old	N/A
	Hem-good-reg	52
	Hem-med-mat	48

Management Unit	Assumptions	
	Hem-medium-im	69
	Hem-medium-old	N/A
	Hem-medium-reg	68
	Hem-poor-im	102
	Hem-poor-mat	70
	Hem-poor-old	N/A
	Hem-poor-reg	98
	Sp-good-old	N/A
	Sp-good-im	60
	Sp-good-mat	38
	Sp-good-reg	53
	Sp-medium-im	76
	Sp-medium-mat	58
	Sp-medium-old	N/A
	Sp-medium-reg	74
	Sp-poor-im	105
	Sp-poor-reg	104

3.1.4 Harvest scheduling priorities

Table 3.4 Harvest scheduling priorities

Management Unit	Assumption
TSA 25	Over the first ten-year period, harvesting priority was assigned to Landscape units where harvesting is being conducted: Ededn Lake, Rennell, Honna, Tasu, Otun, Gudal, Naikoon, Beresford, and Tlell.
TFL 25	No information on harvest scheduling priorities used in the base case are provided in the data package or management plan.
TFL 39	'The "minimum harvest ages" will assist in providing an initial focus for harvest planning. Collection of more detailed information from inventories and site visits will then indicate priority areas for harvest (e.g., forest health) and areas that must be deferred because of non-timber resource issues or because of harvest economics.'
TFL 47 block 18	Two harvest rules were applied: (1) minimize growth loss (minimize volume lost due to decadence) (2) oldest first (age-based)

3.1.5 Harvest flow constraints

Table 3.5 Harvest flow constraints

Management Unit	Assumption
TSA 25	Harvest reductions of more than 10% per decade are avoided.
TFL 25	For harvest volume regulation scenario, harvest reductions of more than 10% per decade are avoided. For harvest area regulation scenario, harvest area remains constant throughout the planning horizon.
TFL 39	Where consistent with IRM requirements, Block 6 will be constrained to ensure that harvest reductions of more than 10% per decade are avoided unless they are necessitated by timberland reallocation to higher land use.
TFL 47	Attempt to maintain the harvest level over the next 20 years, and limit any decline in the harvest level to less than 10% per decade after 20 years.

3.2 Unsalvaged losses

Table 3.6 Unsalvaged losses

Management Unit	Assumption
TSA 25	Annual unsalvaged losses of 3,300 m^3/year were assumed for insect and disease, and 3,800 m^3/year for wind damage.
TFL 25	Annual unsalvaged losses of 1,500 m^3/year assumed for block 6.
TFL 39	1% of harvestable volume assumed as non-recoverable losses
TFL 47	Total reduction of 2.0% for windthrow only.

3.3 Silviculture

3.3.1 Silviculture and regeneration activities in managed stands.

3.3.1.1 TSA 25

Table 3.7 shows the modeling assumptions used in the October 2000 TSR II timber supply analysis report for TSA 25.

Table 3.7 TSA 25 Silviculture and regeneration

#	Analysis unit (AU)	Regen delay (years)	OAF % 1	OAF % 2	Method type	New AU #	New AU %	Density Initial	Density Space	Density %
1	Cedar — low	5	15	5	Plant	3	100	2000	N/A	0
2	Cedar — poor	5	15	5	Plant	2	50	3000	1600	25
		5	15	5	Plant	4	50	7000	1600	50
3	Cedar — good / medium	3	15	5	Plant	8	75	15000	1600	90
		3	15	5	Plant	1	25	15000	1600	90
4	Hemlock — poor	5	15	5	Natural/plant	4	100	30000	1600	90
5	Hemlock — medium	3	15	5	Natural/plant	5	100	20000	1600	90
6	Hemlock — good	3	15	5	Natural/plant	6	100	20000	1600	90
7	Spruce — medium / poor	3	15	5	Natural/plant	7	70	15000	1600	90
		3	15	5	Natural/plant	5	30	15000	1600	90
8	Spruce — good	3	15	5	Plant	8	100	3000	700	25

3.3.1.2 TFL 25 – block 6

A one year regeneration delay was assumed for planted stands, and a 3 year regeneration delay for natural regeneration. Regeneration delay was applied in the timber supply model, not the TIPSY model.

Table 3.8 TFL 25 Silviculture strategies

Table 58 – Silviculture strategies for future stands[13]

Block	AuniI	Ecosystem	Sp 1	%	SI	Sp 2	%	SI	Sp 3	%	SI	Sp 4	%	SI	Initial Density	Regn	OAF 1	OAF 2	Fert
1	F-A-P	A5	Fd	75	34.9	Cw	20	26.0	Ba	5	28.8				1000	P	11	5.6	
1	S-A-P	S3, S13	Ss	40	34.4	Ba	30	28.8	Cw	20	26.0	Hw	10	31.3	1000	P	11	5	
1	H-A-P	S1HA, M3, S15	Hw	60	31.3	Ba	30	28.8	Cw	5	26.0	Fd	5	34.9	1000	P	11	5	
1	F-B-P_F	A1, A2, L3, L1	Fd	80	32.3	Cw	10	25.0	Hw	10	28.8				1000	P	11	9.8	Yes
1	F-B-P	A1, A2, L3, L1	Fd	80	32.3	Cw	10	25.0	Hw	10	28.8				1000	P	11	9.8	
1	F-C-P	N1, L2, N2, A3	Fd	90	24.1	Cw	10	20.8							1000	P	11	5.7	
1	C-C-P_F	A8, S1CH, S8, M4	Cw	90	25.0	Hw	10	28.8							1300	P	11	5	Yes
1	C-C-P	A8, S1CH, S8, M4	Cw	90	20.6	Hw	10	21.4							1300	P	11	5	
1	H-C-P	S2, M1, M2, MH1	Hw	50	21.4	Cw	25	20.6	Ba	25	23.0				1000	P	11	5	
2	S-A-P	S3, S13	Ss	40	29.8	Ba	30	29.1	Cw	20	23.8	Hw	10	30.3	1000	P	15	5	
2	C-A-P	S5, ST5, ST13	Cw	30	23.8	Ba	30	29.1	HW	30	30.3	Fd	10	38.8	1000	P	15	5	
2	H-B-P	S1HA, ST1, M1, MT5	Hw	50	28.1	Ba	40	26.0	Cw	10	20.1				1000	P	15	5	
2	H-B-N	MT1, MT15, M5	Hw	40	28.1	Ba	40	26.0	Yc	20	20.1				4000	N	15	5	
2	H-C-P	M2, S2, ST2	Hw	50	17.6	Cw	20	17.2	Yc	20	17.2	Fd	10	30.7	1000	P	15	5	
2	H-C-N	MH1, MT2	Hw	40	17.6	Ba	30	19.3	Cw	30	17.2				4000	N	15	5	
3	S-A-P	S3, S13, M3	Ss	40	30.6	Ba	30	27.3	Cw	20	20.2	Hw	10	30.6	1000	P	15	5	
3	H-B-P	S1HA, M1	Hw	50	28.9	Ba	30	26.8	Yc	20	19.3				1000	P	15	5	
3	C-C-P	S15, S6, S1CH	Cw	80	17.9	Hw	20	19.7							1000	P	15	5	
3	Y-C-N	M4, MH1	Yc	60	17.9	Hw	20	19.7	Ba	20	20.9				4000	N	15	5	
3	H-C-P	M2, S2	Hw	60	19.7	Yc	40	17.9							1000	P	15	5	
5	S-A-P	CWH vm1, vh2	Ss	70	39.4	Cw	20	26.2	Ba	10	33.7				1000	P	15	5	
5	H-A-P	CWH vm2	Hw	50	33.2	Yc	40	26.2	Ba	10	33.7				1000	P	15	5	
5	H-B-P	CWH vm1	Hw	70	27.2	Ba	20	27.7	Cw	10	20.2				1000	P	15	5	
5	Y-B-P	CWH vm2	Yc	40	20.2	Hw	40	27.2	Ba	20	27.7				1000	P	15	5	
5	C-B-P	CWH vh2	Cw	50	20.2	Yc	30	20.2	Hw	20	27.2				1000	P	15	5	
5	H-B-X	MH mm1, wh1	Hw	60	27.2	Yc	20	20.2	Ba	20	27.7				1000	P	15	5	
5	H-C-P	CWH vm1	Hw	50	19.2	Cw	40	12.2	Ba	10	18.7				1000	P	15	5	
5	Y-C-P	CWH vm2	Yc	50	12.2	Cw	30	12.2	Hw	20	19.2				1000	P	15	5	
5	C-C-P	CWH vh2	Cw	50	12.2	Yc	50	12.2							1000	P	15	5	
5	H-C-N	MH mm1, wh1	Hw	60	19.2	Yc	40	12.2							4000	N	15	5	
6	S-A-P	Q5	Ss	80	33.4	Hw	10	30.6	Cw	10	25.5				1000	P	11	5	
6	S-B-P	Q1, Q1C, Q6, Q12	Ss	80	30.0	Cw	10	24.2	Hw	10	28.7				1000	P	11	5	
6	S-C-P	Q2, Q3, Q15, H5, M3	Ss	80	23.8	Hw	10	22.7	Cw	10	20.6				1000	P	11	5	
6	H-C-P	M1, M1C, M7, H13, H1	Hw	60	23.8	Yc	20	20.6							1000	P	11	5	

[13] Yield curves that exceed TASS/Tipsy data ranges at older ages have had older data extrapolated from the last acceptable value according to the following formula: $Vol_{Age+10} = Vol_{Age}+(Vol_{Age}-Vol_{Age-10})/2$

3.3.1.3 TFL 39

Table 3.9 TFL 39 Regeneration Models

Yield Table ID* **	No. of Planted Stems	No. of Natural Stems	Percent Survival Planted	Percent Distribution Natural	Regen Lag (natural) negative = early	Years of Natural Regen	Spaced 0 = no 1 = yes	Natural regen Site Index
HEMLOCK								
h1	1 200	500	85	50	-2	4	0	
h2	1 200	1 200	90	75	-2	5	0	
h3	900	3 000	90	80	-2	5	0	
h4	800	12 000	85	100	-3	8	0	
h5		600		70		5	0	
h6		1 500		90		5	0	
h7a		6 000		100		5	0	
h7b		6 000		100		5	1	
h8a		12 000		100		5	0	
h8b		12 000		100		5	1	
*a = unspaced, b = spaced @ 15 years to 1200 sph								
DOUGLAS-FIR								
f1a	1 200	500	85	60	0	4	0	
f1b	1 200	500	85	60	0	4	0	Planted-3 m
f2a	1 200	1 200	90	75	0	4	0	
f2b	1 200	1 200	90	75	0	4	0	Planted- 3 m
f3a	1 200	3 000	90	90	-1	5	0	
f3b	1 200	3 000	90	90	-1	5	0	Planted- 3 m
f4		600		70	0	5	0	
f5		1 500		90	0	5	0	
f6		3 000		90	0	5	0	
f7		6 000		90	0	5	0	
**a = fir naturals, b = hemlock naturals if stand planted (Site Index 3 m lower than fir)								

3.3.1.4 TFL 47

Assumed all stands will be planted or naturally regenerated to the species composition described in the table below.

Table 3.10 TFL 47 Regeneration models

AU description	Age	Management Ratios
Ced-good-im	<46	P50/N50
Ced-medium-im	<46	P50/N50
Ced-poor-im	<46	P50/N50
Hem-good-im	<46	N100
Hem-medium-im	<46	N100
Hem-poor-im	<46	N100
Sp-good-im	<46	P50/N50
Sp-medium-im	<46	P50/N50
Sp-poor-im	<46	P50/N50

Stands regenerating from old-growth stands will not be adjusted to reflect the veteran OGSI and QCI stump index studies.

Existing stands less than 46 years of age, and all future regenerating stands are assumed to be established and maintain fully stocked status. Yield tables for regenerated stands were developed using the MoF TIPSY program. Assumed no pre-commercial thinning or other silvicultural activities beyond was is required to maintain full stocking in a timely fashion. Initial planting criteria was 1200 seedlings/ha.

3.3.2 Immature plantation history

Table 3.11 Immature plantation history

Management Unit	Assumption
TSA 25	Immature forests where stand density has been controlled, were assigned to a MSYT, using the following estimates based on silvicultural records: Age 1-10 – 60% managed Age 11-20 – 70% managed Age 21-30 – 60 % managed Age 31-40 – 30% managed
TFL 25	Assigned stands <= 41 years to managed TIPSY curves.
TFL 39	Assigned stands <= 41 years to managed stands, using the Y_XENO yield model.
TFL 47	All existing stands less than 46 years will be modeled with the TIPSY aggregate curves to estimate volumes (all of these qualify as "managed" stands. Approximately one-third of harvested areas have been managed). Existing stands between 46 and 140 will use VDYP yield curves. Stands older than 140 will use AVL curves.

2.3.3 Not satisfactorily restocked areas

Table 3.12 Not satisfactorily restocked areas

Management Unit	Assumption
TSA 25	3752 ha in inventory. NSR stands are brought up to satisfactory stocking in the first decade of the model, and a managed yield curve based on the leading species of the stand is assumed.
TFL 25	Backlog NSR and Natural NSR are assumed fully stocked and will be assigned to an existing managed stand and given an age of 10 years. Current NSR is regenerated to the appropriate future analysis unit within the specified regeneration delay period (1 year in planted stands and 3 years in naturally regenerated stands).
TFL 39	Recorded in annual inventory. NSR stands are brought up to satisfactory stocking in the first decade of the model, and a managed yield curve based on the leading species of the stand is assumed
TFL 47	No areas in TFL 47 Block 18 are classified as backlog NSR in the inventory data.

3.4 Integrated resource management

3.4.1 Visual values

Table 3.13 Visual values

Management Unit	Assumptions		
	Grouping	Green-up height (m)	Maximum allowable area not greened-up (% area)
TSA 25	IRM base area	3	25% of harvestable land base
	RVQC[1] = Retention	6	5% of total forested area
	RVQC = Partial retention	6	15% of total forested area
TFL 25 block 6	No VQOs	3	
	RVQC = Retention	6	5% denudation
	RVQC= Partial retention	6	15% denudation
	RVQC = Modification	6	25% denudation
TFL 39 block 6	RVQC = Retention	6[2]	5% of total forested area
	RVQC = Partial retention	6[3]	15% of total forested area
	RVQC = Modification	6[4]	25% of total forested area
TFL 47 block 18	RVQC = Retention	6	5% denudation
	RVQC = Partial retention	6	15% denudation
	RVQC = Modification	6	25% maximum denudation

1 RVQC = Recommended Visual Quality Class. Green-up height for RVQCs is the visually-effective green-up (VEG), which is achieved when previously harvested openings no longer appear disturbed to potential viewers.

2 Average time required to meet this green-up height was estimated at 17 years for retention RVQC in block 6

3 Average time required to meet this green-up height was estimated at 16 years for partial retention RVQC in block 6

4 Average time required to meet this green-up height was estimated at 16 years for modification RVQC in block 6.

3.4.2 Water quality

Table 3.14 Water quality

Management Unit	Assumption
TSA 25	Green-up height of 5 m and maximum 5% area allowable below green-up height applied to forested area in community watersheds.
TFL 25	No constraints applied.
TFL 39 block 6	No more than 5% of the forested area in community watersheds can be less than 5 years of age at any one time.
TFL 47	No such constraints applied.

3.4.3 Landscape-level biodiversity

Old forest requirements were applied to all units as described in the FPC Landscape Unit Planning Guide.

All reserved old growth is considered to contribute to old seral targets - including non-productive forest, spatial net-downs in productive forest (for soils, ESAs, etc.) , and factor net-downs for small-stream retention areas, TTPs, and additional old-growth reserves and variable

retention. Areas that are currently second-growth can contribute to old seral targets when they reach 250 years of age.

Old seral targets are based on the weighted average of 10%, 45%, and 45% for high, intermediate, and low biodiversity emphases respectively. The low biodiversity emphasis allows for a transition to old seral targets over three rotations.

Table 3.15 Landscape-level biodiversity

Biogeoclimatic unit	Old seral stage requirement		
	% at first rotation[1]	% at 2nd rotation	% at 3rd rotation
CWH	9.7	11.6	13.6
MH	14.2	17.1	19.9

1 – Rotation length was 70 years for all management units except TFL 39, which used a rotation length of 105 years.

3.4.4 Critical Species

3.4.4.1 TSA 25

The Northern Goshawk and Marbled Murrelet are red-listed species on the Queen Charlotte Islands, but no management practices to protect these species beyond those already provided in the FPC had been established at the time of the last timber supply review.

3.4.4.2 TFL 25 block 6

No WHAs or UWR had been designated in TFL 25 at the time of the last timber supply review.

3.4.4.3 TFL 39 block 6

No wildlife critical habitat areas, including ungulate winter range, had been identified in TFL block 6 at the time of the last TSR.

3.4.4.4 TFL 47 block 18

Wildlife habitat areas were accounted for in the Environmentally Sensitive Widlife area reductions (see section 1.4).

3.4.5 Wildlife trees

Table 3.16 Wildlife Tree Patches

Management Unit	Assumption
TSA 25	0.7% incremental WTP retention requirement applied to all analysis units and management zones in the THLB (mean requirement is 2.8% across the THLB, not considering other exclusions)
TFL 25 block 6	5.0% incremental netdown for WTP, CMTs not included in WTP, precautionary buffers, and future changes to retention and riparian management. ???

Management Unit	Assumption
	3.25 % volume net-down to meet future WTP requirements (assumes 75% of WTP will be in areas otherwise constrained).
TFL 39 block 6	In TSR 2, 2.0% WTP (incremental) netdown applied to block 6. Based on 25% of Biodiversity Guidebook WTP requirements, assuming that 75% of these requirements will be met by forests retained on sensitive sites. In the Cortex study, TFL39 area based reductions for voluntary retention were added back to the inclusion factors in order to define the BC2 THLB. Voluntary retention patches were located randomly such that patches were at least two tree lengths from existing forest influences and other patches (80m). In cases where there was no longer area >80m from existing forest influences, patches were allowed initiate inside buffers, such that the probability of initiation was equal to the inverse distance to the existing forest influence. Patch size for retention patches was 1.5 (+- 0.15) ha.
TFL 47 block 18	6.0% (incremental) volume reduction for the overall analysis. (varies by biogeoclimatic unit)

In the BC3 definition of the THLB, 20% of the contributing landbase was allocated in retention patches for all management units. The 20% in-stand retention was located randomly within the contributing landbase, with patch sizes equal to 1.5 (+- 0.15) ha.

3.4.6 Retention

Contributing area within the THLB for all 4 management units was spatially located by placing retention and harvest patches randomly within areas with equal inclusion factors. Areas with equal inclusion factors were assumed to represent the polygon area where the original aspatial area-based reductions had been applied. For each unique inclusion factor strata, the contributing area was determined by summing the product of the inclusion factor and the cell area. In low retention areas (Inclusion < 50%) the landbase was initially set to contributing and patches non-contributing forest were placed. In high retention areas (Inclusion >= 50%) the landbase was initially set to non-contributing and patches of contributing forest were placed. Patch size for retention patches was 1.5 (+- 0.15) ha, and was 2.0 (+- 0.2) ha for harvest patches.

3.4.6.1 Weyerhaeuser Stewardship Zones

The following stewardship zones and netdowns were applied in TFL 39 in Base Case 1.

Table 3.17 Weyerhaeuser Stewardship Zones

Stewardship zone	Retention (%)	Location	Incremental netdown applied (%)[1]	Total % of THLB in block 6 (%)
Old-growth	20	Yakoun Lake Basin, Cumshewa Head area, and on the West Coast of Moresby Island (Security Inlet and Boomchain Bay)	70[2]	4.4
Habitat	15	Lower Yahoun and Tlell Watersheds	7.5	20.2
Timber	5 (dispersed) 10 (group)	Remaining areas	5	75.4

1. It is assumed that the incremental area impact of variable retention is half of the minimum retention level for that zone; existing WTPs are assumed to contribute the rest of the required retention.
2. Two-thirds of the forest in the old-growth zone will already be retained. Therefore the incremental netdown for the old-growth zone is 70%, based on 66% retained, plus 10% (one half of 20%) of the remaining 33% of the zone in incremental variable retention.

In Base Cases 2 and 3, this retention was applied spatially. In the TFL39 old growth zones (see Section 3.4.6), 2/3 of the contributing landbase furthest from roads was set to non-contributing in the BC2 and BC3 THLB definition. The total non-contributing area, calculated prior to the Old Growth reductions, was then allocated in the remaining area closest to roads.

3.5 Analysis Unit Definitions

Table 3.18 Analysis unit definitions 1

Mngt Unit #	Analysis Unit	Species	Site Index	Site	Management State	Total Area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
QCI TSA									
	1	Cw/Yc	SI>=15	G	Natural	17,320	16,469	7,052	9,417
	2	Cw/Yc	15>SI>=12.5	M	Natural	23,766	23,387	13,498	9,889
	3	Cw/Yc	SI<=12.5	P	Natural	170,471	162,763	151,341	11,422
	4	Hw/B	SI>=18	G	Natural	11,651	9,920	5,171	4,749
	5	Hw/B	18>SI>=15	M	Natural	19,198	18,946	12,604	6,342
	6	Hw/B	SI<15	P	Natural	71,148	70,068	54,998	15,070
	7	Ss	SI>=16	G	Natural	10,497	9,957	6,275	3,682
	8	Ss	SI<16	M,P	Natural	18,752	18,179	13,172	5,007
	9	Pl	All	All	Natural	8,162	6,672	6,632	41
	10	Dr	All	All	Natural	1,917	1,466	1,451	15
	101	Cw/Yc	SI>=15	G	Managed	530	466	100	366
	102	Cw/Yc	15>SI>=12.5	M	Managed	264	241	71	170
	103	Cw/Yc	SI<=12.5	P	Managed	536	517	391	126
	104	Hw/B	SI>=18	G	Managed	9,685	9,248	3,996	5,252
	105	Hw/B	18>SI>=15	M	Managed	340	335	110	224
	106	Hw/B	SI<15	P	Managed	2,436	2,281	938	1,343
	107	Ss	SI>=16	G	Managed	3,614	3,554	1,953	1,601
	108	Ss	SI<16	M,P	Managed	574	558	287	271
	109	Pl	All	All	Managed	26	7	7	0

Mngt Unit #	Analysis Unit	Species	Site Index	Site	Management State	Total Area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
	110	Dr	All	All	Managed	811	556	550	5
	999	N/A	NA	NA	NA	83,521	0	0	0
					Total Area QCI TSA	455,217	355,589	280,596	74,993

Mngt Unit #	Analysis Unit	TSR Code	Species	Age Class	Productivity Group	Regen AU Num	TSR Regen Au	Total Area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
TFL 25											
	1	C-A-OG	Cw	>140	A	101	S-A-P	421	421	174	246
	2	C-B-OG	Cw	>140	B	101	S-A-P	144	144	13	131
	3	C-B-OG	Cw	>140	B	102	S-B-P	2,685	2,685	1,390	1,295
	4	C-C-OG	Cw	>140	C	104	H-C-P	7,916	7,805	6,821	985
	5	C-C-OG	Cw	>140	C	101	S-A-P	0	0	0	0
	6	C-C-OG	Cw	>140	C	103	S-C-P	827	827	565	262
	7	C-A-2U	Cw	41-140	A	101	S-A-P	7	7	0	7
	8	C-B-2U	Cw	41-140	B	102	S-B-P	16	16	5	11
	9	C-C-2U	Cw	41-140	C	104	H-C-P	19	19	19	0
	10	C-C-2U	Cw	41-140	C	103	S-C-P	144	142	137	5
	11	C-A-2M	Cw	<=40	A	101	S-A-P	1	1	0	1
	12	C-B-2M	Cw	<=40	B	102	S-B-P	13	13	1	12
	13	C-C-2M	Cw	<=40	C	104	H-C-P	66	66	17	49
	14	C-C-2M	Cw	<=40	C	103	S-C-P	22	22	3	19
	15	D-A-OG	Dr	>140	A	101	S-A-P	5	5	5	0
	16	D-B-OG	Dr	>140	B	102	S-B-P	3	3	3	0

Mngt Unit #	Analysis Unit	TSR Code	Species	Age Class	Productivity Group	Regen AU Num	TSR Regen Au	Total Area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
	17	D-C-OG	Dr	>140	C	104	H-C-P	1	1	1	0
	18	D-C-OG	Dr	>140	C	103	S-C-P	1	1	1	0
	19	D-A-2U	Dr	41-140	A	101	S-A-P	614	614	112	502
	20	D-B-2U	Dr	41-140	B	101	S-A-P	8	8	2	6
	21	D-B-2U	Dr	41-140	B	102	S-B-P	559	559	93	466
	22	D-C-2U	Dr	41-140	C	104	H-C-P	12	12	8	3
	23	D-C-2U	Dr	41-140	C	103	S-C-P	72	72	64	7
	24	D-A-2M	Dr	<=40	A	101	S-A-P	294	294	90	204
	25	D-B-2M	Dr	<=40	B	101	S-A-P	9	9	0	8
	26	D-B-2M	Dr	<=40	B	102	S-B-P	816	816	212	604
	27	D-C-2M	Dr	<=40	C	104	H-C-P	33	33	13	20
	28	D-C-2M	Dr	<=40	C	103	S-C-P	63	63	21	42
	29	H-A-OG	Hw	>140	A	101	S-A-P	576	576	292	284
	30	H-B-OG	Hw	>140	B	101	S-A-P	27	27	1	26
	31	H-B-OG	Hw	>140	B	102	S-B-P	3,534	3,534	1,780	1,755
	32	H-C-OG	Hw	>140	C	104	H-C-P	3,977	3,954	3,282	671
	33	H-C-OG	Hw	>140	C	101	S-A-P	2	2	2	0
	34	H-C-OG	Hw	>140	C	103	H-C-P	637	637	415	221
	35	H-A-2U	Hw	41-140	A	101	S-A-P	285	285	39	247
	36	H-B-2U	Hw	41-140	B	101	S-A-P	50	50	0	50
	37	H-B-2U	Hw	41-140	B	102	S-B-P	2,131	2,131	187	1,945
	38	H-C-2U	Hw	41-140	C	104	H-C-P	304	302	182	120
	39	H-C-2U	Hw	41-140	C	103	S-C-P	100	100	23	78
	40	H-A-2M	Hw	<=40	A	101	S-A-P	369	369	67	303

Mngt Unit #	Analysis Unit	TSR Code	Species	Age Class	Productivity Group	Regen AU Num	TSR Regen Au	Total Area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
	41	H-B-2M	Hw	<=40	B	101	S-A-P	42	42	4	39
	42	H-B-2M	Hw	<=40	B	102	S-B-P	4,790	4,790	451	4,339
	43	H-C-2M	Hw	<=40	C	104	H-C-P	1,058	1,058	310	748
	44	H-C-2M	Hw	<=40	C	103	S-C-P	396	396	51	345
	45	P-B-OG	Pl	>140	B	102	S-B-P	0	0	0	0
	46	P-C-OG	Pl	>140	C	104	H-C-P	35	35	27	8
	47	S-A-OG	Ss	>140	A	101	S-A-P	246	246	91	156
	48	S-B-OG	Ss	>140	B	101	S-A-P	1	1	0	1
	49	S-B-OG	Ss	>140	B	102	S-B-P	400	400	240	160
	50	S-C-OG	Ss	>140	C	104	H-C-P	212	212	166	46
	51	S-C-OG	Ss	>140	C	103	S-C-P	412	408	292	116
	52	S-A-2U	Ss	41-140	A	101	S-A-P	398	398	24	374
	53	S-B-2U	Ss	41-140	B	101	S-A-P	21	21	2	18
	54	S-B-2U	Ss	41-140	B	102	S-B-P	1,675	1,675	103	1,571
	55	S-C-2U	Ss	41-140	C	104	H-C-P	143	143	96	47
	56	S-C-2U	Ss	41-140	C	103	S-C-P	28	28	9	19
	57	S-A-2M	Ss	<=40	A	101	S-A-P	619	619	104	516
	58	S-B-2M	Ss	<=40	B	101	S-A-P	38	38	6	33
	59	S-B-2M	Ss	<=40	B	102	S-B-P	4,871	4,871	342	4,529
	60	S-C-2M	Ss	<=40	C	104	H-C-P	668	668	148	519
	61	S-C-2M	Ss	<=40	C	102	S-B-P	1	1	1	0
	62	S-C-2M	Ss	<=40	C	103	S-C-P	314	314	27	287
	63	Y-A-OG	Yc	>140	A	101	S-A-P	3	3	2	1
	64	Y-B-OG	Yc	>140	B	101	S-A-P	0	0	0	0

Mngt Unit #	Analysis Unit	TSR Code	Species	Age Class	Productivity Group	Regen AU Num	TSR Regen Au	Total Area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
	65	Y-B-OG	Yc	>140	B	102	S-B-P	233	233	178	55
	66	Y-C-OG	Yc	>140	C	104	H-C-P	2,640	2,640	2,416	224
	67	Y-C-OG	Yc	>140	C	103	S-C-P	182	182	175	8
	68	Y-B-2U	Yc	41-140	B	102	S-B-P	3	3	2	0
	69	Y-C-2U	Yc	41-140	C	104	H-C-P	42	42	41	0
	70	Y-C-2U	Yc	41-140	C	103	S-C-P	0	0	0	0
	71	Y-C-2M	Yc	<=40	C	104	H-C-P	12	12	0	12
	101	S-A-P	Ss	<=40	A	101	S-A-P	17	17	10	7
	102	S-B-P	Ss	<=40	B	102	S-B-P	173	173	16	157
	103	S-C-P	Ss	<=40	C	103	S-C-P	11	11	0	10
	104	H-C-P	Hw	<=40	C	104	H-C-P	192	192	32	160
	999	NA	NA	NA	NA	NA	NA	7,152	0	0	0
						Total Area TFL 25		53,792	46,497	21,406	25,091

Analysis Unit #	Analysis Unit	Age Class	Species	Site	Site Index	Total Area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
TFL 39									
	1	35-139	Fd/Pl/Yc	G	Si>=24	33	33	4	28
	2	35-139	Fd/Pl/Yc	M	24>Si>18	338	240	88	152
	3	35-139	Fd/Pl/Yc	P	Si<=18	3	3	2	1
	4	ALL	Fd/Pl/Yc	Marg	24>Si>18	0	0	0	0
	5	ALL	Fd/Pl/Yc	Marg	Si<=18	101	83	55	28

Analysis Unit #	Analysis Unit	Age Class	Species	Site	Site Index	Total Area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
	6	<35	Fd/Pl/Yc	G	SI>=24	0	0	0	
	7	<35	Fd/Pl/Yc	M	24>SI>18	244	214	64	151
	8	<35	Fd/Pl/Yc	P	SI<=18	66	57	13	44
	9	>=140	Fd/Pl/Yc	M	24>SI>18	0	0	0	0
	10	>=140	Fd/Pl/Yc	P	SI<=18	297	220	154	66
	11	35-139	Hw/Ss/Cw	H	>=30	9,823	7,539	3,703	3,836
	12	35-139	Hw/Ss/Cw	G	30>SI>=24	5,846	4,441	1,927	2,514
	13	35-139	Hw/Ss/Cw	M	24>SI>18	1,276	1,017	423	594
	14	35-139	Hw/Ss/Cw	P	SI<=18	2,835	2,343	854	1,489
	15	ALL	Hw/Ss/Cw	Marg	>=30	306	241	91	149
	16	ALL	Hw/Ss/Cw	Marg	30>SI>=24	776	669	309	360
	17	ALL	Hw/Ss/Cw	Marg	24>SI>18	0	0	0	0
	18	ALL	Hw/Ss/Cw	Marg	SI<=18	15,550	11,377	4,890	6,486
	19	<35	Hw/Ss/Cw	H	SI>=30	10,747	9,191	3,263	5,929
	20	<35	Hw/Ss/Cw	G	30>SI>=24	61,896	52,124	18,108	34,016
	21	<35	Hw/Ss/Cw	M	24>SI>18	10,794	8,527	3,137	5,390
	22	<35	Hw/Ss/Cw	P	SI<=18	6,620	5,248	1,692	3,556
	23	>=140	Hw/Ss/Cw	H	SI>=30	1,675	1,345	637	708
	24	>=140	Hw/Ss/Cw	G	30>SI>=24	12,958	9,445	3,950	5,495
	25	>=140	Hw/Ss/Cw	M	24>SI>18	17,062	13,842	5,320	8,521
	26	>=140	Hw/Ss/Cw	P	SI<=18	44,946	35,084	14,158	20,925
	555	ALL	Dr/Ac	H	SI>=27	3,482	2,602	1,405	1,198
	556	ALL	Dr/Ac	G	27>SI>=24	950	668	348	320
	557	ALL	Dr/Ac	M	24>SI>=21	0	0	0	0
	558	ALL	Dr/Ac	P	SI<21	11	7	5	2

Analysis Unit #	Analysis Unit	Age Class	Species	Site	Site Index	Total Area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
	999	NA	NA	NA	NA	33,335	25,744	11,268	14,476
					Total Area TFL 39	241,970	192,305	75,870	116,435

Analysis Unit #	Analysis Unit	Age Class	Species	Site	Site Index	Mngt State	Total Area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
TFL 47										
	1	<=45	Cw/Yc	M	26>SI>=19	Immature	1,192	1,171	117	1,053
	2	<=45	Cw/Yc	G	SI>=26	Immature	0	0	0	0
	3	46-140	Cw/Yc	P	19>SI>=10.5	Mature	32	32	20	12
	4	>140	Cw/Yc	P	19>SI>=10.5	Old	3,299	3,296	1,211	2,085
	5	>140	Cw/Yc	M	26>SI>=19	Old	1,206	1,206	391	815
	6	<=45	Cw/Yc	P	19>SI>=10.5	Regen	789	777	115	661
	7	<=45	Cw/Yc	M	26>SI>=19	Regen	315	315	38	277
	8	<=45	Dr/Ac	G	ALL	Immature	343	298	100	198
	9	>45	Dr/Ac	G	ALL	Mautre	116	111	37	74
	10	<=45	Hw/B	P	18>SI>=9.5	Immature	254	254	29	225
	11	<=45	Hw/B	M	25>SI>=18	Immature	3,921	3,834	520	3,314
	12	<=45	Hw/B	G	SI>=25	Immature	3,542	3,450	377	3,073
	13	46-140	Hw/B	P	18>SI>=9.5	Mature	56	56	21	36
	14	46-140	Hw/B	M	25>SI>=18	Mature	330	326	77	249
	15	46-140	Hw/B	G	SI>=25	Mature	422	420	69	351
	16	>140	Hw/B	P	18>SI>=9.5	Old	306	306	136	169
	17	>140	Hw/B	M	25>SI>=18	Old	2,422	2,421	1,181	1,240
	18	>140	Hw/B	G	SI>=25	Old	186	186	108	79

Analysis Unit #	Analysis Unit	Age Class	Species	Site	Site Index	Mngt State	Total Area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
	19	<=45	Hw/B	P	18>SI>=9.5	Regen	42	42	2	40
	20	<=45	Hw/B	M	25>SI>=18	Regen	185	185	43	142
	21	<=45	Hw/B	G	SI>=25	Regen	8	8	1	7
	22	<=45	Ss	P	16>SI>=7.5	Immature	125	125	13	112
	23	<=45	Ss	M	24.5>SI>=16	Immature	2,410	2,369	384	1,984
	24	<=45	Ss	G	SI>=24.5	Immature	3,148	3,036	322	2,713
	25	46-140	Ss	M	24.5>SI>=16	Mature	7	7	6	1
	26	46-140	Ss	G	SI>=24.5	Mature	541	528	88	441
	27	>140	Ss	M	24.5>SI>=16	Old	130	127	62	65
	28	>140	Ss	G	SI>=24.5	Old	125	125	97	28
	29	<=45	Ss	P	16>SI>=7.5	Regen	0	0	0	0
	30	<=45	Ss	M	24.5>SI>=16	Regen	2	2	1	1
	31	<=45	Ss	G	SI>=24.5	Regen	3	3	1	2
	999	NA	NA	NA	NA	NA	2,051	98	77	21
						Total Area TFL 47	27,507	25,112	5,645	19,467

Analysis Unit #	Analysis Unit	Species	Site	Site Index	Total Area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
National Parks								
	1	CW/YC	G	SI>=15	7,438	0	0	0
	2	CW/YC	M	15>SI>=12.5	5,044	0	0	0
	3	CW/YC	P	SI<=12.5	58,142	0	0	0
	4	HW/B	G	SI>=18	7,452	0	0	0
	5	HW/B	M	18>SI>=15	10,897	0	0	0

Analysis Unit #	Analysis Unit	Species	Site	Site Index	Total Area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
	6	HW/B	P	SI<15	14,355	0	0	0
	7	SS	G	SI>=16	4,961	0	0	0
	8	SS	M,P	SI<16	7,018	0	0	0
	9	PL	All	All	9,576	0	0	0
	10	DR	All	All	963	0	0	0
	999	NA	NA	NA	21,707	0	0	0
			Total Area National Parks		147,554	0	0	0

Analysis Unit #	Analysis Unit	Species	Site	Site Index	Total Area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
Provincial Park								
	1	CW/YC	G	SI>=15	4,230	0	0	0
	2	CW/YC	M	15>SI>=12.5	5,035	0	0	0
	3	CW/YC	P	SI<=12.5	30,906	0	0	0
	4	HW/B	G	SI>=18	953	0	0	0
	5	HW/B	M	18>SI>=15	879	0	0	0
	6	HW/B	P	SI<15	4,134	0	0	0
	7	SS	G	SI>=16	2,360	0	0	0
	8	SS	M,P	SI<16	7,975	0	0	0
	9	PL	All	All	1,690	0	0	0
	10	DR	All	All	87	0	0	0
	999	NA	NA	NA	19,411	0	0	0
			Total Area QCI TSA		77,660	0	0	0

4.0 Environmental Indicator Model

4.1 Representation of Linear Features

4.1.1 Roads

To summarize road impact, measures of the total length and density of roads in each unique landscape strata are required. Although there is potential for higher spatial accuracy in higher resolution representation of the current road network (i.e., 10m road cells), future roads will be constructed using a grid cell resolution of 50m. To maintain consistency with current and future measurements of road impact, and to minimize computer memory limitations and processing time, measurements of road length and stream crossings are made using 50m grid resolution. The current and future road network was originally rasterized at 10m cell resolution. These layers were then resampled to 50m cell resolution by assigning the maximum value of the resampled 10m grid cells. This ensured that road cells remained contiguous.

Measuring roads at a coarser resolution has the potential for error; some roads may only cross a small portion of a 50m cell, while the length of road in these cells would be counted as the total cell width. There is also the potential to underestimate the length of roads crossing diagonally through a cell. However, to a certain extent these errors will cancel each other out, and the overall error should be within acceptable limits. Furthermore, measurement error should be consistent with current and future roads as future roads will be activated and created using a grid resolution of 50m.

The length of roads in each unique landscape stratum is computed as the product of the number of road cells in each sratum and the cell width (i.e., 50m). This step is processed in the environmental indicators summary model (see below).

4.1.2 Stream Crossings

The current road network is used for current conditions. The road network is divided into segments, each with a unique id. Nodes separating road segments form at bifurcations of the road network, and at administrative boundaries.

The model initiates in the end node of all road segments and spreads along the active segments until it reaches the start node position. A stream crossing is counted if a road segment crosses a stream. Because streams often run parallel to streams, at 50m grid resolution, multiple road cells can intersect with stream cells. Therefore, only one stream crossing can be counted for each road segment. Stream crossings are only counted only on the road mainline where the bridge is assumed to be (i.e. not on spur roads). The number of stream crossings per stream class is then summed for each unique landscape stratum in the environmental indicators summary model (see below).

4.2 Point sampling buffer for goshawk

Area within currently and potential goshawk territories is measured using a point buffer sampling model implemented in SELES. Each nest site location is visited and a circular buffer is grown out to the specified buffer width. Within the buffer the area of forest within each seral stage class is measured and recorded along with the nest site id. Nest sites are processed

sequentially and buffers placed over old ones. Thus the landscape may get counted twice in areas where two territories overlap.

4.3 Environmental Indicators

A series of environmental indicators are produced from the results of the STSM landscape projection. These indicators include: ecosystem representation; hydroriparian impact, road impact, Black Bear habitat, Marbled Murrelet (MaMu) habitat, Northern Goshawk (NoGo) habitat, and Windthrow Risk. A model was implemented in SELES that stratifies the landscape into unique management units, and at each reporting interval measures and reports landscape attributes, such as the area forests or the area harvested, for each unique strata combination. The resulting data tables can be summarized using pivot tables to report results summaries for any combination of reporting strata. Each environmental indicator requires specific combination of landscape strata and reporting results. The reporting requirements for each indicator are summarized in tables D.2 to D.6.

Appendix A - Development of the Spatial Landbase

A.1 Attributes of Spatial Data

The data coverages used in this analysis to define the modeling area, timber harvesting land base,. and current management practices for the QCI LUP analysis area are listed in Table A.1.

Table A.1 Data atttributes

Data	Sources	Comments / Data Description
Forest Cover	TFC_QC7G – updated forest cover coverage	Partial resultant with structure similar to the coverage used for the QCI EGSA. Recent additions include Haida Protected Areas, PTT Watersheds (with latest LU boundary), and ecosections
	LOG_2003 – Gowgaia update (with licensee updates)	
Administra-tive Units	TPAS_QC – Provincial and National parks HPA – Haida Protected Areas QCIG1_SA – Goal 1 study areas QCIG2_SA – Goal 2 study areas	
Forest Tenures	TWL_QC - Woodlots TTFL_QC – TFLs HG_LICENSES – Forest licenses	
	TLU_QC – Landscape Units – original version	Includes BEOs. LU boundaries have been refined in the PTT watershed coverage.
	PTTWAT_1 – PTT Watersheds (Option 1) TCWSA_QCI – Community watersheds ABEC_QC – BEC	Latest version of BEC To be added
	QCI_WOODSHEDS – Woodsheds STWRD – Weyerhaeuser stewardship zones	
Streams / Riparian	TRMA_QC – Riparian management Areas (modelled) HYRORIPARIAN TRIM water features (streams, lakes, rivers)	Will be available shortly
Roads	QCI_ROADS – Roads coverage from woodshed analysis (includes existing and proposed roads) FTRN_QCI – INCOSADA Roads coverage (most current existing roads coverage for QCI – from district office) ROADBUF – 12 metre Road buffer (buffer of FTRN_QCI)	
Terrain Stability	TSM_QCI – Level D TSM for TSATTER_25_6 – TSM for TFL 25TTER_39_6 – TSM for TFL 39TTER_47_18 – TSM for TFL 47TTER_DQC – Reconnaissance level TSM for TSA	
Slope / Elevation	TDEM_QC – elevation grid TSLP_QC – slope grid	
Wildlife	NOGO2 – Northern Goshawk Territories WHAS for goshawk and mamu	To be added
Visual Quality	TFC_QC7G has VQO's used in TSR	

A.2 Spatialization of the THLB

The Spatialized Netdowns model is implemented using SELES and is based on a spatialization algorithm previously developed by Steven Northway for TFL 39. The model operates on grid (raster) data layers with a cell resolution of 10m[1]. The objective of the model is to convert the contributing landbase from proportional inclusion factors to a binary THLB layer, where each cell is designated as either contributing or non-contributing. This involves reallocating a percentage of the contributing landbase into retention patches, where the area to be retained is computed from the inclusion factors. Because the GIS layers that were originally used to locate netdowns in the TSR2 resultants are not available, retention blocks are placed randomly within strata composed of areas with equal inclusion factors. We make the assumption that, in the absence of more specific location data, contiguous areas with equal inclusion factors are most likely to have had the same netdown criteria applied. In the spatialization process different classes of retention are specified, each with different methods of allocation. For clarity, we make a distinction between two types of variable retention: 1) legislated retention, 2) voluntary retention.

A.2.1 Legislated Retention

Legislated retention represents the non-contributing area presently represented aspatially within the partially contributing landbase (i.e., where, 0 < Inclusion Factor < 1). Allocation of legislated retention patches was applied to all management units.

The operable landbase was first divided into low retention areas (≥ 50% inclusion), and high retention areas (<50% inclusion). All high retention cells were initially set to *non-contributing* and the total contributing area was computed for these cells by summing the product of the inclusion factor and the cell area. Conversely, in low retention areas all cells were initially set to *contributing*, and the total non-contributing area for these cells was computed by summing 1 minus the inclusion factor multiplied by the cell area. Harvest patches are placed in high retention areas, and retention patches are placed in low retention areas. Placing harvest patches in high retention areas simulates harvest block openings within contiguous forest, rather than producing amalgamating a large number retention patches. Retention and harvest patch sizes were selected from normal distributions with means of 1.5 (sd±0.15) ha, and 2 (sd±0.20) ha, respectively.

Because the original polygons used to allocate netdown percentages were not available, we make the assumption that cells with the same inclusion factor value represent contiguous areas where the same netdown criteria would have been applied. Thus, for each unique inclusion factor value we define a strata, and within each strata we compute the contributing area (or non-contributing in low retention areas) from the inclusion factors for that strata.

The model then iterates through each unique inclusion factor strata, and places retention or harvest patches randomly within areas within the current inclusion factor strata. Patches have equal probability of initiating in any cell with the current inclusion factor. If patches initiate on or near a boundary, they can spread into adjacent areas where inclusion factors are different provided there is area available to allocate. If this occurs, the area for the neighbouring inclusion factor strata is decremented. Patches are placed and grown until there is no longer area

[1] Note that at 10m resolution the total number of grid cells for TSA25 is 178,387,979 (10,241 rows X 17,419 cols). Thus, each layer requires 1.43 Gigabytes of RAM to load into the SELES model. This requires that the study area be divided into a series of subsets, which are then processed separately.

remaining for the current strata. Patch shapes are complex; with the complexity of the shape controlled by randomly varying the rate of spread to adjacent cells.

A.2.1.1 Correction to TSA25 Inclusion Factors

In the original TSR inclusion factors, roads and RMA's netted had been netted out aspatially in TSA25, by applying a uniform percent reduction across the entire contributing landbase. Layers representing the spatial location of roads and riparian management areas (RMAs) for TSA25 were provided by John Sunde (MSRM). The RMA buffers were created in two stages. First buffers representing riparian exclusion areas were created around streams. Buffers were then further extended until the area within the buffer was equal to the contributing area specified in the riparian management zone. Given these layers, the non-contributing land in roads and RMA's could be spatially located within the THLB. This involved an initial correction to the TSA inclusion factors, i.e., adding back 9.8% to all cells with inclusion factors greater than 0, and an additional 7.2% to cells with stand age between 1 and 80 years. Areas in roads or RMA buffers were designated as non-contributing and the placement of retention and harvest patches were excluded from these areas. Table 2.2 provides a summary of the contributing area in TSA25 prior to the RMA/Road add backs and following spatial netdowns.

Table A.2 Summary of area in TSA25 THLB both prior to, and following the RMA/Road corrections.

Area (ha)	TSA25
BC1 Contributing Area (Pre-Correction)	84,670
Contributing Area w 9.8% & 7.2% add back	95,018
Contributing Area w RMA/Roads removed	74,337
Legislated Retention Area	22,492
Area in RMA and Roads	20,681
Total Area (Contributing + Non-Contributing)	117,510

A.2.1.2 TFL39 - Voluntary Retention

In TFL 39, an additional percentage of the total contributing area was further allocated as 'voluntary retention' patches (Table 2.3). Voluntary retention had already been aspatially netted out of the original inclusion factors, and therefore needed to be added back prior to placement of legislated retention. Voluntary retention patches were placed > 80m from existing retention patches and all 'forest influences', where forest influences were defined as all non-contributing forested areas.

Following the placement of legislated retention, 80m buffers were grown around all existing retention patches and forest influences. Voluntary retention was then allocated within the contributing THLB, in sets of 100 randomly placed non-overlapping patches. Once each set of patches is placed, new 80m buffers are grown around these patches, and a further set of patches were placed. As with the harvest and retention patches, the shape of the voluntary retention

patches was controlled by random variation around the rate of spread to adjacent cells. This continues until the remaining voluntary retention area decreased to zero.

A.2.2.3 TFL 39 - Old Growth Reductions

Spatial allocation of the non-contributing landbase in TFL 39 Old Growth Stewardship Zones differs from other zones. Of the total area of contributing forest, 66% of the area furthest from roads was designated as non-contributing. The total non-contributing was allocated as legislated retention in the remaining area closest to roads. A further 10% of the remaining 33% of the contributing landbase was then allocated in voluntary retention patches. Voluntary retention patches were placed and located following the same rules for voluntary retention patches specified above.

Table A.3 Voluntary retention and Old Growth reductions in TFL 39 stewardship zones.

TFL 39 stewardship zone	BC1 Contributing Area (ha) With VR Add Back Applied	Contributing Area (ha) Prior to VR Add Back	Voluntary Retention (% of Contributing)	Actual Contributing Area (ha) (Post VR and OG reductions)	Total Reductions
Timber	96,078	91,297	5%	91,299	4.98%
Habitat	28,279	24,370	7.5%	24,371	7.50%
Old Growth 1	26,347	1,120	10%	292	76.60%
Old Growth 2	1,245	1,548	10%	402	76.60%
Old Growth 3	1,721	699.7	10%	182	76.60%

A.2.2.4 BC3 THLB Definition

Starting with BC2 THLB, Haida Protected areas were removed from all management units. This reduced contributing area in TSA25 by ~32%, ~6.5% in TFL39, and <1% in TFL25 and TFL47. Of the remaining area, a further 20% reduction representing in-stand retention was applied to all management units. In-stand retention patches were located randomly within the contributing landbase, with patch shape and size parameters defined for the BC2 legislated retention patches.

Within TFL39, the contributing area defined for BC2 is reduced to 50%. After removal of Haida PA's and in-stand retention, additional retention patches were placed to meet the 50% reduction target. Of the remaining area, 2/3 were placed in cedar stands, and the remaining 1/3 allocated randomly within the contributing landbase. Cedar stands were identified using the Historical Analysis Units layer provided by John Sunde (MSRM). Priority for placement of patches in cedar stands was first in cedar Good/Medium, followed by Cedar Poor, and Cedar Low.

Table A.4 Summary of BC3 netdowns in TSA25, TFL25 and TFL47

Netdown Description	TSA25	TFL25	TFL47
Contributing Area (BC2 THLB)	74,331	25,085	19,474

Netdown Description	TSA25	TFL25	TFL47
Haida PA's	23,753	7	0
In-stand Retention Area (20%)	10,115	5,016	3,894
Contributing Area (BC3 THLB)	40,464	20,063	15,580

Table A.5 Summary of BC3 netdowns for TFL39

Netdown Description	TFL39
Contributing Area (BC2 THLB)	123,675
Haida PA's	8,129
Instand Retention (20%)	23,109
Cedar Reduction	20,442
Random Reduction	10,221
Contributing Area (BC3 THLB)	61,774

A.2.2.5 History of implementation

1. Initial SELES Spatialization Model Developed and Tested using TFL 25. Probability of initiating retention blocks is based on the inclusion factors. Results verified and accepted by J. Sunde.
2. 10m spatial databases for TFL25, TFL47, TFL39 and TSA25 are spatialized.
3. Decision to correct inclusion factors requires creation of road and RMA layers and revisions to the spatialization and verification models
4. Respatialization of THLB with corrections to inclusion factors.
5. Potential bias for AU's with low inclusion factors identified. Decision to modify how retention and harvest blocks are placed so that they follow inclusion factor strata.
6. Additional modifications to TSA25 Inclusion Factor layer
7. Respatialization of THLB with revised TSA25 inclusion factors, and revised placement criteria

Appendix B - Landbase Assumptions (Target Models)

Management themes are landbase descriptors used in the model to apply management objectives and constraints to guide management actions. This section presents a detailed list and description of management themes used in the models.

B.1 Management Units

This theme represents all management units found in the QCI LUP analysis area. Table 4.1 lists all management units and the corresponding area breakdown

Table B.1 Management unit summary

Management Unit	Total Area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
QCI TSA	455,718	355,987	280,662	75,325
TFL 25	53,800	46,501	21,409	25,092
TFL 39	242,239	192,566	82,302	110,264
TFL 47	27,516	25,125	5,666	19,459
National Parks	147,554	NA	NA	NA
Provincial Parks	77,660	NA	NA	NA
Total area				

B.2 Woodshed Units

This theme represents the woodshed units that were used in the Timberline Woodshed Analysis. These units allow grades, prices, and costs to be associated with management unit specific woodshed units. Table 4.3 lists the woodshed units found in the QCI LUP area.

Table B.2 QCI LUP analysis area woodshed units

ID	Woodshed Name	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
1	Conspicuous	111,004	95,653	74,404	21,249
2	Eden	55,189	45,598	28,629	16,969
3	Hancock	21,059	13,539	11,930	1,609
4	Skonun	35,015	20,722	15,619	5,103
5	Sewall	14,981	12,846	9,682	3,164
6	Dinan	58,364	45,121	15,996	29,125
7	Iron Side	31,399	22,438	19,781	2,657
8	Ferguson	97,315	85,425	32,554	52,871
9	Tlell	29,209	26,562	16,868	9,694

10	Seal	20,869	16,229	15,163	1,066
11	Rennell	17,683	16,374	13,980	2,394
12	Skidegate	23,596	18,541	10,520	8,021
13	Kano	20,797	15,543	15,217	326
14	Dawson	22,208	15,487	15,218	269
15	Hump	14,141	12,105	8,431	3,673
16	Alliford	38,078	31,136	9,064	22,072
17	Deena	14,404	12,841	3,962	8,879
18	Security	13,798	8,543	8,286	257
19	Moresby	14,092	11,705	3,580	8,125
20	Louise	27,618	23,179	11,137	12,042
21	Newcombe	4,556	3,488	2,203	1,284
22	Kuper	21,257	10,876	10,615	260
23	Kootenay	42,161	33,881	19,955	13,926
24	Talunkwani	5,292	5,053	1,703	3,350
25	Tasu	8,486	6,533	5,101	1,432
26	Otun	14,030	10,302	9,996	306
99	Not available	227,888	460	445	15
	Total	1,004,489	620,180	390,039	230,138

B.3 Provincial Landscape Units

The provincial landscape units are represented in the model to ensure that TSR forest cover requirements can be modeled. Table 4.4 lists the landscape units found in the QCI LUP analysis area.

Table B.3 Provincial landscape units

ID	LU Name	Total area (ha)	Productive (ha)	THLB (ha)	Inoperable (ha)
0	Not available	556	5	0	5
1	Athlow Bay	48,081	28,951	3,138	25,813
2	Beresford	60,197	53,742	9,123	44,619
3	Bigsby	20,133	0	0	0
4	Eden Lake	50,348	43,635	19,345	24,290
5	Gowgaia	41,101	0	0	0
6	Gudal	29,165	20,067	255	19,812
7	Hibben	45,302	28,562	1,500	27,062
8	Honna	30,752	26,258	10,791	15,467

9	Ian	32,328	25,027	16,958	8,070
10	Jalun	31,603	25,129	5,322	19,806
11	Kunghit Island	12,905	0	0	0
12	Louise Island	27,617	23,180	12,042	11,138
13	Lower Yakoun	30,438	26,389	16,296	10,093
14	Lyell Island Group	23,827	0	0	0
15	Masset Inlet	53,708	46,198	29,441	16,757
16	Naikoon	111,550	26,087	6,469	19,618
17	Otun	72,297	54,022	9,576	44,446
18	Rennell	39,626	33,047	3,689	29,358
19	Sewell	47,262	31,962	18,107	13,855
20	Skidegate Lake	53,399	45,057	32,585	12,472
21	Skincuttle	40,027	0	0	0
22	Tasu	33,858	25,998	7,551	18,446
23	Tlell	41,451	34,671	16,635	18,036
24	Yakoun Lake	26,957	22,194	11,318	10,875
	Total area	1,004,488	620,181	230,141	390,038

B.4 Contribution Class

This theme indicates the area that contributes to the productive forest, timber harvesting land base (THLB), and inoperable productive forest. Table 4.5 shows the contribution classes found in the model.

Table B.4 QCI LUP contribution classes

Contribution Class	Description	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
THLB	Productive forest that is operable to harvesting	318,068	318,062	93,468	224,594
INOP	Productive forest that is not operable to harvesting	466,018	299,421	293,956	5,465
EXCL	Non-productive forest	220,400	2,695	2,614	81
	Total area	1,004,486	620,178	390,038	230,140

B.5 Harvesting System

The harvesting system theme indicates the harvesting method used in the model. These methods are based on management unit TSR information of the Timberline Woodshed Analysis data. For

areas not operable to harvesting the conventional systems has been assigned. Table 4.6 lists the harvesting systems used in the QCI LUP analysis area.

Table B.5 QCI LUP harvesting systems

Harvesting System	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
Heli-logging	947,354	577,807	364,530	213,277
Conventional	57,132	42,372	25,508	16,864
Total area	1,004,486	620,179	390,038	230,141

B.6 Management State

This theme indicates the current management state of the stands. There are currently two types of management states defined: existing natural (not managed through planting or density management) and existing managed (managed through planting or density management). Once harvested a stand will transition to a future management state using TSR guidelines. Table 4.7 lists the summarizes the management states for the QCI LUP analysis area.

Table B.6 QCI LUP management states

Management State	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
Existing natural	833,288	500,115	360,568	139,547
Existing managed	170,143	119,009	29,301	89,708
Timber licence	1,055	1,055	170	886
Total area	1,004,486	620,179	390,039	230,141

B.7 Biogeoclimatic Zone /Sub-zone / Variant

This theme represents ecological zones found in the QCI LUP analysis area. These zones will be used with the provincial landscape units to formulate certain forest cover requirements. Table 4.8 lists the ecosystem zones found in the QCI LUP.

Table B.7 QCI LUP ecosystem zones

Ecosystem Zone	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
AT unp	8,383	293	291	2
CWH vh 2	303,096	162,429	139,516	22,913
CWH wh 1	554,779	370,474	196,745	173,729

CWH wh 2	84,120	65,551	36,120	29,431
MH wh 1	33,428	11,134	10,025	1,109
MH wh 2	19,070	10,226	7,288	2,938
Not available	1,611	71	54	17
Total area	1,004,487	620,178	390,039	230,139

B.8 Natural Disturbance Type

This theme represents the natural disturbance types (NDT) found in the QCI LUP analysis area. The NDT's will be used with the provincial landscape units and ecological zones to generate certain forest cover requirements. Table 4.9 lists the NDT's found in the QCI LUP area.

Table B.8 QCI LUP natural disturbance types

NDT	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
1	994,492	619,814	389,693	230,121
5	9,966	364	345	19
Not available	28	0	0	0
Total area	1,004,486	620,178	390,038	230,140

B.9 Visual Quality Objective Zones

The visual quality objective (VQO) zones used in the last TSR are represented in this theme. Table 4.10 lists the VQO zones found in the QCI LUP analysis area.

Table B.9 QCI LUP VQO zones

VQO Zones	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
Not visual	852,948	495,738	297,954	197,784
M - modification	17,172	14,561	7,645	6,916
PR – partial retention	87,424	70,330	53,820	16,510
R - retention	46,941	39,550	30,621	8,930
Total area	1,004,485	620,179	390,040	230,140

B.10 Community Watersheds

This theme represents the community watershed found in the QCI LUP. This theme will be used to constraint harvesting activities within the community watersheds. Table 4.11 lists the areas in the QCI LUP analysis area defined as community watersheds.

Table B.10 QCI LUP community watersheds

Community Watershed	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
Not a community watershed	996,625	612,859	387,063	225,795
Community watershed	7,861	7,320	2,976	4,345
Total area	1,004,486	620,179	390,039	230,140

B.11 Ecosections

This theme represents the ecosections found in the QCI LUP analysis area. Ecosections will be one of the main reporting units in the model. Table 4.12 lists the ecosections.

Table B.11 QCI LUP ecosections

Ecosection	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
Queen Charlotte Lowland	347,179	175,750	151,162	24,588
Queen Charlotte Ranges	326,994	200,218	128,390	71,828
Skidegate Plateau	330,285	244,211	110,486	133,725
Not available	28	0	0	0
Total area	1,004,486	620,179	390,038	230,141

B.12 Cabinet approved PAS study areas - Goal 1

The Goal 1 cabinet approved protected areas strategy study areas are represented in this theme. Table 4.13 shows the Goal 1 study areas.

Table B.12 QCI LUP Goal 1 PAS study area

Goal 1 PAS ID	Goal 1 PAS Name	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
4	Gudal Bay/Marble Island	1,808	928	928	0
8	NW Graham Island	31,990	26,579	23,184	3,395
22	Yakoun Lake	8,063	5,204	4,850	355
	Total area	41,861	32,711	28,962	3,750

B.13 Cabinet approved PAS study areas – Goal 2

This theme represents the Goal 2 cabinet approved protected areas strategy study areas. Table 4.14 list the Goal 2 study areas

Table B.13 QCI LUP Goal 2 PAS study areas

Goal 2 PAS ID	Goal 2 PAS Name	Total area (ha)	Productive (ha)	THLB (ha)	Inoperable (ha)
89	Sturgess Bay/Maast Island	36	33	18	14
91	Naden/Davidson River Estuaries - 1	5	5	3	2
92	Naden/Davidson River Estuaries - 2	47	19	5	13
96	Eden Lake - south end	98	90	48	42
98	Kumdis Slough/Yakoun Bay	151	90	4	85
100	Boulton Lake ERP#107	71	35	15	21
108	Kumdis Slough/Yakoun Bay	28	16	0	16
124	Tlell River Pontoons ERP#318	687	401	66	335
127	Survey Creek	489	481	296	184
130	Shingle Bay/Spit Point - 1	6	0		
132	Shingle Bay/Spit Point - 2	10	0		
133	Tana Bay	49	38		38
135	Grey Bay/Cumshewa Head	1,235	849	63	786
137	Kitgoro Inlet	1,861	1,605	60	1,545
140	Takakia Lake ERP#25A	611	58		58
141	Kootenay Inlet ERP#25B	2,069	1,068	153	914
	Total area	7,453	4,788	153	3,341

B.14 Haida Protected Areas

This theme represents the Haida protected areas. Table 4.15 lists the protected areas found in the QCI LUP analysis area.

Table B.14 Haida protected areas

Haida Protected Area Name	Total Area (ha)	Productive (ha)	THLB (ha)	Inoperable (ha)
Duu Guusd	150,271	115,294	18,090	97,204
Gwaii Gawgaay	3,649	3,068	721	2,346
Jiinanga	63	7	1	6
Kamdis	1,342	1,145	443	702
Kun Xalaas	2,705	1,349	36	1,313
Nang Xaldangaas	5,611	5,102	2,127	2,976
Qanuu	334	257		257
Qanuu Gandll	82	82	3	79
Qaysun	2,209	1,876	50	1,827
Tllall	16,770	15,335	7,992	7,343
Tsuuguus Gandll	1,706	1,364	83	1,281
Yaagun Siwaay	11,765	8,442	1,774	6,668
Total area	196,507	153,321	9,902	122,002

B.15 Northern Goshawk Habitat

This theme represents the TSR defined northern goshawk habitat. Two types of habitat have been defined: nesting and foraging. Table 4.16 lists the goshawk habitat found in the QCI LUP analysis area.

Table B.15 QCI LUP northern goshawk habitat

Nesting Habitat	Foraging Habitat	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
No	Yes	2,000	1,763	1,186	577
Yes – area 1	No	2,464	2,196	490	1,707
Yes – area 2	No	301	277	121	156
Yes – area 3	Yes	327	326	208	118
Yes – area 4	No	170	147	47	101
Yes – area 4	Yes	73	50	18	32
Yes – area 5	No	200	156	44	112
Yes – area 6	No	175	159	36	123

	Table area	5,710	5,074	2,150	2,926

B.16 Tlell Watershed

The Tlell watershed boundary is represented with this theme. This boundary is required in the model for possible harvest flow constraints. Table 4.17 summarizes the area within the Tlell watershed

Table B.16 Tlell watershed

Theme	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
Tlell Watershed	31,808	27,078	13,662	13,415

B.17 Tlell Fire Area

The Tlell fire area is represented in this theme. Table 4.18 summarizes the area found in the Tlell fire boundary.

Table B.17 Tlell fire area

Theme	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
Tlell fire area 1	60,666	28,966	17,555	11,411
Tlell fire area 2	8,199	5,668	3,133	2,535
Total Tlell fire boundary	1,004,486	620,179	390,039	230,140

B.18 Stewardship Zones

The TFL 39 stewardship zones are represented with this theme. The zones have unique modeling characteristics and must be modeled separately. Table 4.19 summarizes the zones.

Table B.18 TFL 39 stewardship zones

Stewardship zone	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
Timber	161,015	135,342	48,713	86,629
Habitat	39,012	33,857	11,342	22,516
Old growth – zone 1	8,302	6,125	5,782	342
Old growth – zone 2	27,403	13,952	13,450	502
Old growth – zone 3	6,321	3,225	3,005	220

Total area	242,053	192,501	82,292	110,209

B.19 PTT Watersheds

The PTT watershed are represented in this theme. The PTT watershed are the major reporting unit in the model. Table 4.20 lists the PTT watershed defined for the QCI LUP.

Table B.19 QCI LUP PTT watersheds

PTT ID	PTT Name	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
0	Not available	556	5	5	0
1	Newcombe Inlet	8,769	7,113	3,790	3,323
2	Kootenay Inlet	12,604	8,436	7,503	933
3	Fairfax Inlet	4,271	2,962	2,419	543
4	Botany Inlet	8,213	7,487	4,734	2,753
5	Skaat Harbour	6,043	0	0	0
6	Rose Inlet	10,938	0	0	0
7	Louscoone Inlet	6,285	0	0	0
8	Huston Inlet	9,350	0	0	0
9	Burnaby Island	7,410	0	0	0
10	Skidegate Lake	16,088	14,295	2,285	12,009
11	Skidegate Channel	1,639	1,534	469	1,064
12	Haans Creek	7,312	6,060	1,555	4,505
13	Gray Bay Cumshewa	10,444	6,625	3,622	3,003
14	Deena Creek	6,999	6,108	2,232	3,876
15	Aero Camp	4,127	4,001	897	3,104
16	Alliford Bay	6,790	6,434	1,411	5,023
17	Tangil Penninsula	2,482	2,152	1,059	1,093
18	Talunkwan Island	4,342	4,242	1,455	2,787
19	Sewell Inlet	5,575	4,906	1,976	2,930
20	Pacofi Bay	3,979	3,682	1,275	2,407
21	Newcombe Peak	7,250	5,286	3,194	2,092
22	Mosquito Lake	8,688	7,122	2,312	4,809
23	Lagoon Inlet	3,191	2,786	1,667	1,119
24	Klunkwoi Bay	5,114	5	5	0
25	Hoya Passage	2,574	0	0	0
26	Crescent Inlet	4,067	1,780	911	870

PTT ID	PTT Name	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
27	Tanu	3,634	0	0	0
28	Gogit Passage	11,301	0	0	0
29	Atli Bay	8,891	0	0	0
30	Sedans Creek	5,189	3,914	1,652	2,262
31	Rockfish Harbour	4,744	4,188	2,029	2,159
32	Mathers Creek	8,413	6,750	3,786	2,964
33	Waste Creek	3,356	3,223	1,021	2,202
34	Breaker Bay Creek	2,926	2,527	1,331	1,196
35	Beattie Anchorage	2,989	2,578	1,318	1,259
36	Kunghit Island	12,905	0	0	0
37	Bottle Inlet	7,319	3,696	3,679	17
38	Security Inlet	7,909	4,884	4,683	202
39	Kuper Inlet	9,207	3,655	3,425	230
40	Kitgoro Inlet	8,864	7,132	6,987	145
41	Inskip Channel	3,002	1,466	1,438	28
42	Hibben Island	3,378	2,922	2,920	2
43	Government Creek	1,930	1,637	825	811
44	Chaatl Island	3,693	3,170	3,105	65
45	Puffin Cover	9,685	0	0	0
46	Sunday Inlet	8,617	0	0	0
47	Gowgaia Bay	16,330	0	0	0
48	Staki Bay	6,469	0	0	0
49	Marshall Inlet	8,208	0	0	0
50	Skittagetan Lagoon	11,925	0	0	0
51	Phantom Creek	1,894	1,602	1,444	158
52	Upper Yakoun River	6,036	5,495	1,822	3,672
53	Yakoun Lake	8,372	5,522	4,926	595
54	King Creek	2,345	2,201	738	1,463
55	Ghost Creek	4,863	4,244	1,161	3,083
56	Brent Creek	3,447	3,131	783	2,347
57	Survey Creek	5,444	4,910	1,442	3,468
58	Lower Tlell River	10,398	8,900	6,255	2,645
59	Lella Creek	7,000	6,449	3,246	3,202
60	Geike Creek	3,232	1,869	1,289	580
61	Feather Creek	4,567	4,158	1,428	2,731
62	Lawn Hill	7,988	6,034	3,678	2,356
63	Three Mile Creek	2,820	2,351	698	1,653

PTT ID	PTT Name	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
64	Tartu Inlet	6,608	5,594	5,053	541
65	Shields Bay	6,991	5,138	4,829	310
66	Seal Inlet	10,203	7,493	7,014	478
67	Riley Creek	3,142	3,018	2,866	152
68	Bill Brown Creek	2,865	2,705	2,280	424
69	Hangover Creek	1,979	1,766	1,456	310
70	Gregory Creek	3,390	3,137	2,564	574
71	Bonanza Creek	4,447	4,197	3,297	900
72	Wia Point	6,714	4,653	4,151	502
73	Sewall Creek	4,962	4,631	2,640	1,992
74	Otun River	14,592	10,667	10,250	417
75	Kitt Hawn Creek	9,788	6,209	5,340	869
76	Hancock River	19,973	14,717	12,672	2,045
77	Craft Bay	5,363	4,995	2,389	2,606
78	Christie River	10,905	8,149	7,003	1,146
79	Kumdis Island	3,600	2,766	831	1,935
80	Watun River	8,570	4,027	3,611	415
81	Skonun River	15,762	4,923	4,828	96
82	Rose Spit	6,122	0	0	0
83	Oeanda River	16,634	34	34	0
84	Mayer Lake	12,661	2,558	2,074	485
85	Kumdis Creek	6,152	4,562	2,856	1,706
86	Hiellen River	14,661	316	316	0
87	Cape Ball Creek	19,709	2,060	1,905	156
88	Boulton Lake	7,679	4,838	3,162	1,676
89	Buckley Bay	3,090	2,848	787	2,061
90	McClinton Bay	6,166	4,498	1,757	2,741
91	Mamin River	11,056	10,299	4,127	6,171
92	Towustasin Hill	4,511	4,188	1,415	2,774
93	Dinan Bay	4,664	3,553	1,274	2,279
94	Datlamen Creek	6,177	5,314	2,137	3,178
95	Cowhoe Bay	2,216	2,056	491	1,565
96	Blackwater Creek	3,435	3,195	1,247	1,948
97	Begbie Penninsula	5,176	4,932	1,315	3,618
98	Awun River	7,216	5,314	2,208	3,106
99	Lower Yakoun River	12,407	9,775	4,164	5,611
100	Log Creek	4,929	4,489	2,007	2,483

PTT ID	PTT Name	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
101	Gold Creek	3,250	3,009	1,193	1,816
102	Florence Creek	5,389	5,106	1,431	3,675
103	Canyon Creek	2,724	2,552	783	1,769
104	Blackbear Creek	1,738	1,457	515	942
105	Kung	8,615	7,028	4,732	2,296
106	Klashwun Point	4,254	3,426	3,015	410
107	Jalun River	18,734	14,675	12,059	2,616
108	Ian Southwest	2,461	1,667	579	1,088
109	Ian Northeast	5,979	4,861	1,788	3,073
110	Tara Creek	4,547	3,465	1,311	2,154
111	Ain River	4,110	3,510	1,049	2,460
112	Bill Creek	3,496	3,042	794	2,248
113	Ian Lake	9,394	6,778	2,132	4,647
114	Crease Creek	2,340	1,705	416	1,289
115	Trounce Inlet	4,062	3,479	2,669	809
116	Slatechuck Creek	4,912	4,129	2,870	1,259
117	Queen Charlotte Skidegate	6,439	5,421	2,214	3,206
118	Renner Pass	4,895	4,439	2,251	2,189
119	Long Inlet	5,700	4,296	3,615	681
120	Honna River	4,745	4,495	1,847	2,648
121	Gudal Bay	9,373	5,738	5,719	19
122	Kano Inlet	11,572	9,513	9,384	128
123	Dawson Inlet	4,144	2,124	2,092	32
124	Dawson Harbour	4,075	2,693	2,617	76
125	Stanley Creek	6,126	5,216	3,375	1,841
126	Roy Lake	4,927	4,330	2,636	1,694
127	Lignite Creek	14,718	12,607	6,930	5,677
128	Naden River	12,690	10,675	5,548	5,127
129	Davidson Creek	11,887	10,806	5,801	5,005
130	Sialun Creek	8,436	7,648	6,874	774
131	Lepas Bay	6,529	5,868	5,357	510
132	Langara Island	3,169	2,432	2,432	0
133	Hana Koot Creek	6,273	5,832	5,153	679
134	Haines Creek	11,642	10,642	8,192	2,450
135	Cave Creek	10,736	9,300	6,367	2,933
136	Beresford Creek	13,412	12,019	10,243	1,776
137	Tian Head	4,972	3,752	3,268	484

PTT ID	PTT Name	Total area (ha)	Productive (ha)	Inoperable (ha)	THLB (ha)
138	Port Chanal	4,543	26	26	0
139	Otard Creek	9,028	6,649	5,654	995
140	Mercer Lake	4,036	2,324	2,089	235
141	Hosu Cove	2,123	1,459	1,396	63
142	Hippa Island	6,389	2,873	2,873	0
143	Fortier Hill	3,234	2,601	1,985	616
144	Coates Creek	8,544	5,839	5,096	743
145	Athlow Bay	5,212	3,428	3,425	3
	Total area	1,004,479	620,177	390,030	230,143

Appendix C - Landscape Model – HGLM

C.1 Landbase Assumptions

Table C.1 Spatial data requirements of the Haida Gwaii Landscape Model (HGLM).

Input	Description	Usage
Required Layers		
BEC	Biogeoclimatic Zones	Used both to define the study area and for cover constraints
ForestCover	Forest cover % scaled by FCScale (e.g. it can be a simple 0/1 layer or more detailed	
THLBContribution	THLB contribution in % scaled by THLBScale (e.g. Currently a simple 0/1 layer, but can be proportional)	Indicates the area that contributes to the timber harvesting land base (THLB).
AU	Initial Analysis units	
StandAge	Starting age for contributing and non-contributing portion of cell	
Dist2ActiveRds	Distance in metres to nearest active road	
NearestRoadLoc	Location of nearest road cell	
RoadType	Road class	
LU	Landscape units	Used both for default operating areas layer and for zone reference in cover constraints (ensures that TSR forest cover requirements can be modeled)
MU	Management Units	To match AU's with management unit guidelines used in the last timber supply review (TSR).
VQO	Visual Quality Objectives	to define zones for cover constraints
NDT	Natural Disturbance Type	used with the provincial landscape units and ecological zones to generate certain forest cover requirements
ProductiveForest	FALSE/TRUE (0,1)	
OperabilityCost	Operability cost layer. Can be in any range of increasing cost, from 0 on, but must be consistent with the *OperThresh* parameter	not implemented
MgtState	Management State	to define transitions
RoadBackbone		For building spur roads
RoadSegmentId	Road segments – unique id assigned to length of road between two nodes. Nodes placed at bifurcations in road network, and at administrative boundaries	For building spur roads
NearestRoadSegment	ID of nearest road segment.	For building spur roads
zero	Layer used to set up cumulative spatial outputs (TotalVolumeHarvested, TimesHarvested, and MeanAge)	

C.2 Landbase Requirements

Table C.2 Spatial data requirements of the SELES Environmental Indicator Output model.

Input Layer	Name	Description
BEC	Biogeoclimatic Zones	Used both to define the study area and as a stratification layer
Elevation	Elevation	Used to define MaMu habitat
isForested	Productive Forests	Used to identify productive forest
StandAge	Stand Age	Used as a stratification layer to report area by seral stage
MgtState	Management State	Used as a stratification layer to report area by management state
StandHeight	Stand Height	Used as a stratification layer to report area by stand height class
CrownClosureClass	Crown Closure Class	Used as a stratification layer to report area by crown closure class
AreaHarvested	Area harvested	Layer with location of harvesting in current time period.
MaMuHabitat	Marbled Murrelet Habitat	MaMu habitat map – created from separate MaMu HSI submodel
PTTWatershed	PTT Watershed Unit	Stratification Layer
LandStatus	Land Status	Stratification Layer: THLB, Protected Area Name, Inoperable, RMA's, and Other Operable Excluded
LU	Landscape Unit	Stratification Layer
Ecosection	Ecosection	Stratification Layer
EU	Ecological Analysis Units	Stratification Layer
HRZoneInfluence	Hydroriparian zone of influence	Stratification Layer
MU	Management Unit	Stratification Layer
StreamCrossings	Stream Crossings	Used for counting number of stream crossings per stratum
RoadSegmentID	Road Segment ID	Road segment ID for road network. Used for measuring road length and density

Appendix D - Environmental Indicators Model

D-1 Landbase Requirements

Table D.1 Spatial data requirements of the SELES Environmental Indicator Output model.

Input Layer	Name	Description
BEC	Biogeoclimatic Zones	Used both to define the study area and as a stratification layer
Elevation	Elevation	Used to define MaMu habitat
isForested	Productive Forests	Used to identify productive forest
StandAge	Stand Age	Used as a stratification layer to report area by seral stage
MgtState	Management State	Used as a stratification layer to report area by management state
StandHeight	Stand Height	Used as a stratification layer to report area by stand height class
CrownClosureClass	Crown Closure Class	Used as a stratification layer to report area by crown closure class
AreaHarvested	Area harvested	Layer with location of harvesting in current time period.
MaMuHabitat	Marbled Murrelet Habitat	MaMu habitat map – created from separate MaMu HSI submodel
PTTWatershed	PTT Watershed Unit	Stratification Layer
LandStatus	Land Status	Stratification Layer: THLB, Protected Area Name, Inoperable, RMA's, and Other Operable Excluded
LU	Landscape Unit	Stratification Layer
Ecosection	Ecosection	Stratification Layer
EU	Ecological Analysis Units	Stratification Layer
HRZoneInfluence	Hydroriparian zone of influence	Stratification Layer
MU	Management Unit	Stratification Layer
StreamCrossings	Stream Crossings	Used for counting number of stream crossings per stratum
RoadSegmentID	Road Segment ID	Road segment ID for road network. Used for measuring road length and density

D-2 Environmental Indicator Output Files

The reporting requirements for each environmental indicator are summarized below in tables D.2 to D.6.

Table D.2 Environmental indicator output file standards for the ecosystem representation indicator provided through the HG/QCI forest-level modelling process.

Ecosystem Representation	Unit	Column Descriptions
Strata Columns	Year	Reporting period (7): 0, 20, 50, 100, 150, 200, 250
	BEC variant (BECv)	BECv (7): BEC variant label
	Management Unit (MU)	MU(6): Management Unit
	Analysis Unit (AU)	AU
	Land status (LandStat)	LandStat (3): THLB, Inoperable, Excluded
	Ecosections (EcoSec)	EcoSec (3): Skidegate Plateau, QC Ranges, QC Lowland.
	Analysis units (AU)	AU (182)
	Age Class (AC)	AC (10): 0-20, 21-40, 41-60, 61-80, 81-100, 101-120, 121-140, 141-180, 181-250, >250yrs
	Height Class (HtCls)	HtCls (4): 0-10, 10-20, 20-30, 30-40m
Result Columns	Area in stratum	Area in Stratum (1)
	Units: ha	

Table D.3 Environmental indicator output file standards for the hydroriparian and road impact indicators provided through the HG/QCI forest-level modelling process.

Hydroriparian and Road Impact	Unit	Column Descriptions
Strata Columns	Year	Reporting period (7): 0, 20, 50, 100, 150, 200, 250
	BEC variant (BECv)	BECv (7): BEC variant label
	PTT Watershed (PTT)	PTT (145): PTT Watershed Label
	Hydroriparian Zone of Influence (HRZone)	HRZone (1)
	Management Unit (MU)	MU (4): QCTSA, TFL25, TFL47, TFL39
Result Columns	Total Area (Area)	Area in Stratum (1)
	Units: ha	
	Harvested Area (HarvArea)	Area harvested in Stratum(1)
	Units: ha	
	Number of Stream Crossings (StrCr)	Number of Stream Crossings in each road class in each stratum (3): highway, mainline, spur
	Units: n/a	

Hydroriparian and Road Impact	Unit	Column Descriptions
	Road Length (kmRd) Units: km	Length of Road in Stratum in each road class in each stratum (3): highway, mainline, spur

Hydroriparian and Road Impact Backcast	Unit	Column Descriptions
Strata Columns	Year	Reporting period (7): 1800, 1850, 1900, 1950, 1980
	BEC variant (BECv)	BECv (7): BEC variant label
	PTT Watershed (PTT)	PTT (145): PTT Watershed Label
	Hydroriparian Zone of Influence (HRZone)	HRZone (3): notHZOI, HZOI1, HZOI2
	Management Unit (MU)	MU (4): QCTSA, TFL25, TFL47, TFL39
Result Columns	Total Area (Area) Units: ha	Area in Stratum (1)
	Harvested Area (HarvArea) Units: ha	Area harvested in Stratum(1)
	Number of Stream Crossings (StrCr) Units: n/a	Number of Stream Crossings
	Road Length (kmRd) Units: km	Length of Road in each stratum

Table D.4 Environmental indicator output file standards for the Goshawk indicator provided through the HG/QCI forest-level modelling process.

Goshawk	Unit	Column Descriptions
Strata Columns	Year	Reporting period (7): 0, 20, 50, 100, 150, 200, 250
	PTT Watershed (PTT)	PTT (145): PTT Watershed Label
	Goshawk Territories (NoGoTerr)	NoGoTerr (8): Territory ID
	Age Class (AC)	AC (1-9): 0-20, 21-40, 41-60, 61-80, 81-100, 101-120, 121-140, 141-250, > 250yrs
Result Columns	Total Area Units: ha	Area (1)

Table D.5 Environmental indicator output file standards for the Marbled Murrelet indicator provided through the HG/QCI forest-level modelling process.

Marbled Murrelet	Unit	Column Descriptions
Strata Columns	Year	Reporting period (7): 0, 20, 50, 100, 150, 200, 250
	BEC variant (BECv)	BECv (7): BEC variant label
	Ecosystem Units (EU)	EU (?)
	Ecosections (EcoSec)	EcoSec (3): Skidegate Plateau, QC Ranges, QC Lowland.
	Landscape Units (LU)	LU (24): LU labels
	PTT Watershed (PTT)	PTT (145): PTT Watershed Label
	Age Class (AC)	AC (1-9): 0-20, 21-40, 41-60, 61-80, 81-100, 101-120, 121-140, 141-250, > 250yrs
	Crown Closure (CC)	CC (1-3): 0-40, 41-70, 71-100%
	Elevation (Elev)	Elev (1-4): 0-300, 300-600, 600-1000, >1000m.
	Height Class (HtCls)	HtCls (1- 4): 0-10, 10-20, 20-30, 30-40m
Result Columns	Total Area Units: ha	Area (1)

Table D.6 Environmental indicator output file standards for the Black Bear indicator provided through the HG/QCI forest-level modelling process.

Black Bear	Unit	Column Descriptions
Strata Columns	Year	Reporting period (7): 0, 20, 50, 100, 150, 200, 250
	PTT Watershed (PTT)	PTT (145): PTT Watershed Label
	TEM Unique ID (TEMid)	
	Structural Stage (SS)	SS (7)
Result Columns	Total Area Units: ha	Area in Stratum (1)
	Road Length (kmRd) Units: km	Length of Road in Stratum in each road class in each stratum (2): mainline, spur
	Road Density (densRd) Units km/km^2	
	Road Usage (usgRd) Units: Vehicles/day/km^2	Available once the STSM is implemented.
	Cedar Units: trees/ha	